STUDENT MANUAL

Excel 2013: Formulas and Functions

Towson University

Office of Technology Services

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Excel 2013: Formulas and Functions

Excel 2013: Formulas and Functions

Part Number: 222782
Course Edition: 1.0

Acknowledgements

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How to Use This Book

As You Learn

This book is divided into lessons and topics, covering a subject or a set of related subjects. In most cases, lessons are arranged in order of increasing proficiency.

The results-oriented topics include relevant and supporting information you need to master the content. Each topic has various types of activities designed to enable you to practice the guidelines and procedures as well as to solidify your understanding of the informational material presented in the course. Procedures and guidelines are presented in a concise fashion along with activities and discussions. Information is provided for reference and reflection in such a way as to facilitate understanding and practice.

Data files for various activities as well as other supporting files for the course are available by download from the LogicalCHOICE Course screen. In addition to sample data for the course exercises, the course files may contain media components to enhance your learning and additional reference materials for use both during and after the course.

At the back of the book, you will find a glossary of the definitions of the terms and concepts used throughout the course. You will also find an index to assist in locating information within the instructional components of the book.

As You Review

Any method of instruction is only as effective as the time and effort you, the student, are willing to invest in it. In addition, some of the information that you learn in class may not be important to you immediately, but it may become important later. For this reason, we encourage you to spend some time reviewing the content of the course after your time in the classroom.

As a Reference

The organization and layout of this book make it an easy-to-use resource for future reference. Taking advantage of the glossary, index, and table of contents, you can use this book as a first source of definitions, background information, and summaries.

Course Icons

Watch throughout the material for these visual cues:

Icon	Description
	A **Note** provides additional information, guidance, or hints about a topic or task.
	A **Caution** helps make you aware of places where you need to be particularly careful with your actions, settings, or decisions so that you can be sure to get the desired results of an activity or task.
	LearnTO notes show you where an associated LearnTO is particularly relevant to the content. Access LearnTOs from your LogicalCHOICE Course screen.
	Checklists provide job aids you can use after class as a reference to performing skills back on the job. Access checklists from your LogicalCHOICE Course screen.
	Social notes remind you to check your LogicalCHOICE Course screen for opportunities to interact with the LogicalCHOICE community using social media.
	Notes Pages are intentionally left blank for you to write on.

1 Performing Calculations

Lesson Time: 1 hour

Lesson Objectives

In this lesson, you will:

- Create formulas in a worksheet.
- Insert functions in a worksheet.
- Reuse formulas.

Lesson Introduction

In the last lesson, you got started with Microsoft® Office Excel® 2013. One of the primary reasons for using electronic worksheets is the ease of calculating data. In this lesson, you will perform calculations.

We have all used a pencil and scrap of paper to do quick calculations, but when the numbers get larger and the calculations more complicated, it's easy to make errors. By using Excel formulas and functions to calculate your data, you are less likely to encounter errors, you can save time, and you can present the results of the calculations in a consistent manner.

TOPIC A

Create Formulas in a Worksheet

In this lesson, you will perform calculations on data in the Excel 2013 environment. The easiest way to calculate data in Excel is to use formulas. In this topic, you will create formulas in a worksheet.

Manually calculating data values can be time consuming and can lead to inaccurate results. Using formulas in your worksheets can help you automate your calculations and help ensure that your calculations are accurate.

Excel Formulas

A *formula* performs complex numeric calculations with addition, subtraction, multiplication, and division. A formula comprises an expression to the right and a result to the left of an equal sign. The expression in a formula usually consists of a combination of variables, constants, and operators.

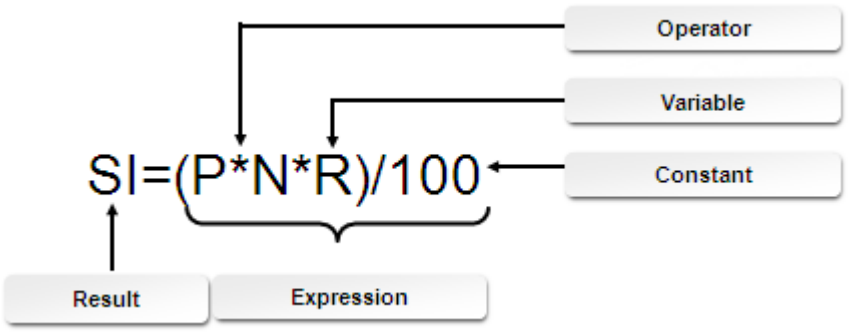


Figure 1-1: A mathematical formula to compute simple interest.

An Excel formula is a type of formula that can be used to perform calculations on data that is entered in Excel worksheets.

The Formula Bar

The *Formula Bar*, located below the ribbon, contains the **Name Box,** the **Insert Function** button, and the **Formula Bar** text box. The **Name Box** displays the name or reference of the selected cells. The **Insert Function** button enables you to insert a function in the selected cell. The **Formula Bar** text box displays the contents of the selected cell and allows you to edit the contents. You can expand, collapse, resize, or hide the **Formula Bar** to suit your preferences.

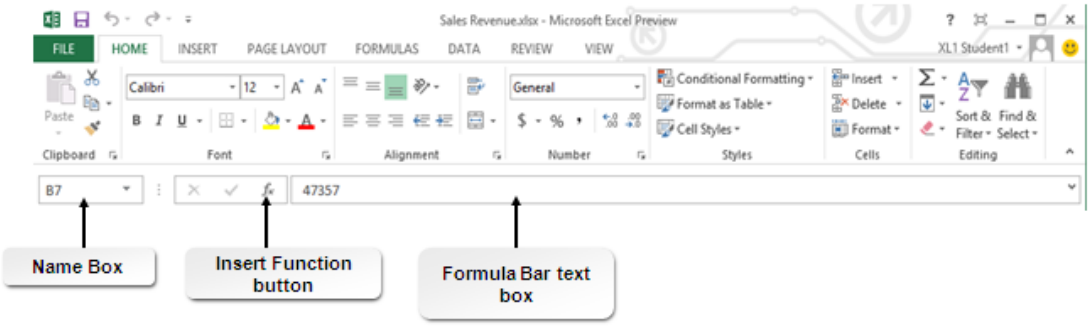


Figure 1-2: The Formula Bar.

Elements of an Excel Formula

All formulas in Excel begin with an equal sign and contain various components such as arguments and operators. The result of an Excel formula is stored in the cell where the formula is entered. When the data of the arguments in an Excel formula changes, the formula automatically recalculates the result. You can revise existing formulas by pressing **F2** and changing the arguments in the formula.

An Excel formula can contain various elements, as described in the following table.

Formula Element	*Description*
References	Addresses of cells or ranges of cells on a worksheet that refer to the location of the values or data upon which you need to apply a formula for calculation.
Operators	Symbols that specify the kind of calculation that needs to be performed on the components of a formula.
Constants	Numbers or text that do not change in a formula.
Functions	Predefined formulas in Excel that are used to simplify complex calculations.

Common Mathematical Operators

Mathematical operators are symbols or signs that are used to represent an arithmetic operation in Excel.

Mathematical Operator	*Function*
Parentheses ( )	Group computation instructions
Caret (^)	Exponent
Asterisk (*)	Multiplication
Forward slash (/)	Division
Plus sign (+)	Addition
Minus sign (-)	Subtraction

The Order of Operations

Excel enables you to create formulas that contain multiple mathematical operators. These mathematical operators are computed in a specific order. When you use a combination of operators, the order of evaluation can affect the result of the formula. Excel evaluates the mathematical operators in the following order:

1. Computations enclosed in parentheses, wherever they appear in the formula.
2. Computations involving exponents.
3. Computations involving multiplication and division. Because they are equal with regard to the order in which Excel performs them, the operation is performed in the order in which it encounters them, which is from the left to the right.
4. Computations involving addition and subtraction. Excel also performs them in the order in which it encounters them.

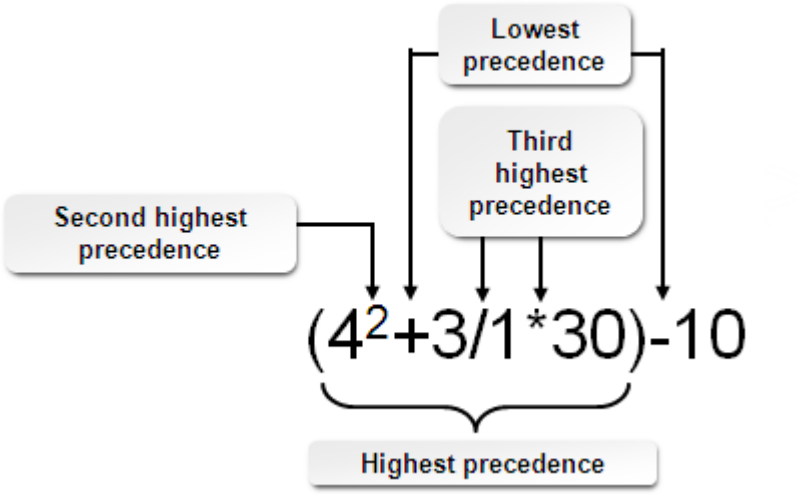


Figure 1-3: Mathematical operators are computed in a specific order.

How to Create Formulas in a Worksheet

Here are the general steps you will use to create formulas in worksheets.

Note: All of the How To procedures for this lesson are available as checklists from the **Checklist** tile on the LogicalCHOICE Course screen.

Create a Formula

To create a formula:

1. Select the cell in which you want to place the formula.
2. To begin the formula, type an equals sign.
3. Specify the arguments and operators for the formula.
   - Enter a number or cell reference, or select a cell.
   - Enter the operator.
   - Enter another number or cell reference.
4. If necessary, enter additional arguments and operators to complete the formula.
5. Press **Enter** or select the check mark icon to apply the formula and populate the cell with the calculated value.

Revise a Formula

To revise a formula:

1. Select the cell that contains the formula that you want to revise.
2. Revise the formula.
   - Activate the cell by double-clicking it or pressing **F2**, select the desired part of the formula that needs to be revised, and then make the desired changes.
   - On the **Formula Bar,** select the desired part of the formula that needs to be revised, and then make the desired changes.
3. Press **Enter** or select the check mark icon to apply the revised formula.

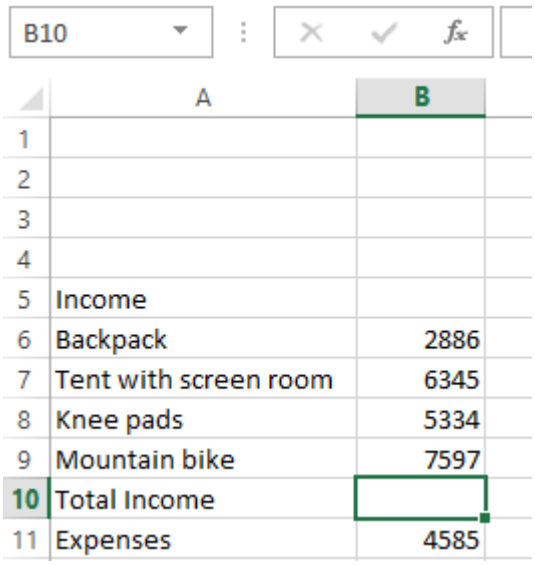
ACTIVITY 1-1
Creating Formulas in a Worksheet

Data Files
C:\091014Data\Performing Calculations\New Product Income.xlsx

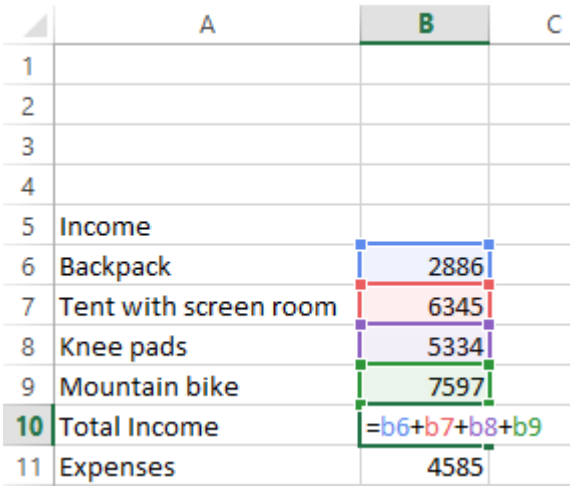
Scenario
The management of My Footprint Sports has planned to introduce four new products. You need to determine the income from these products by analyzing the estimated sales data, expenses, tax, and the profit after tax.

---

1. Calculate the total income for the products.
   a) To open the worksheet, select **FILE→Open.** On the **Open** screen, navigate to the **C:\091014Data \Performing Calculations** folder, and open the **New Product Income.xlsx** file.
   b) Select cell **B10**.



   c) Type ***=b6+b7+b8+b9*** and press **Enter** to display the total income of the products.



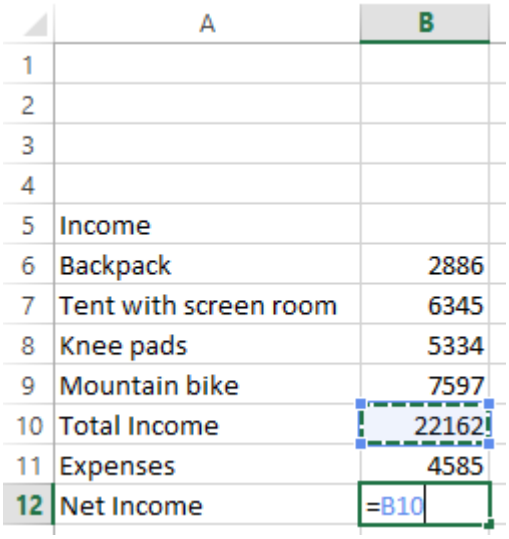
	A	B	C
1			
2			
3			
4			
5	Income		
6	Backpack	2886	
7	Tent with screen room	6345	
8	Knee pads	5334	
9	Mountain bike	7597	
10	Total Income	=b6+b7+b8+b9	
11	Expenses	4585	

d) Verify that the sum of the values in cells B6 through B9 is displayed in cell B10.

2. Calculate the net income for the products.

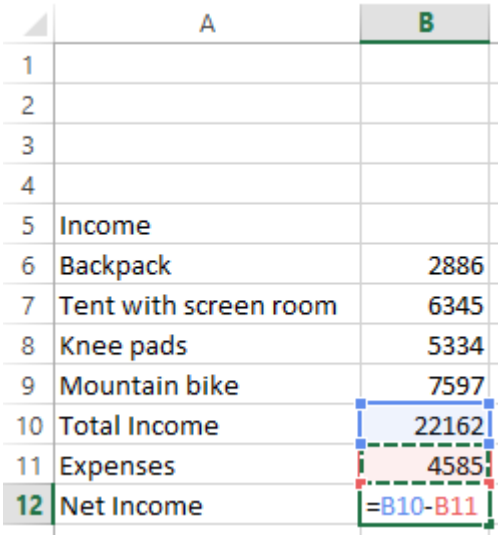
a) Select cell **B12.**

b) Type **=** and select cell **B10.**



	A	B
1		
2		
3		
4		
5	Income	
6	Backpack	2886
7	Tent with screen room	6345
8	Knee pads	5334
9	Mountain bike	7597
10	Total Income	22162
11	Expenses	4585
12	Net Income	=B10

c) Type **-** and select cell **B11.**



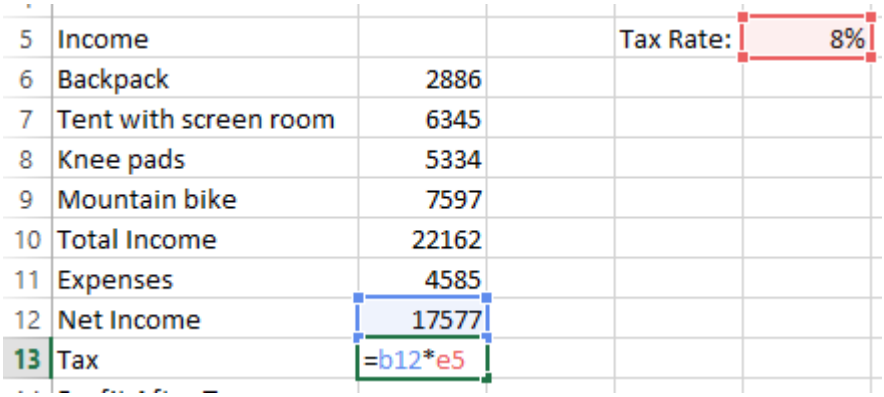
	A	B
1		
2		
3		
4		
5	Income	
6	Backpack	2886
7	Tent with screen room	6345
8	Knee pads	5334
9	Mountain bike	7597
10	Total Income	22162
11	Expenses	4585
12	Net Income	=B10-B11

d) Observe the formula that is displayed in the **Formula Bar,** and then press **Enter.**

3. Calculate the tax and profit after tax for the products introduced in the market.

a) Verify that cell **B13** is selected.

b) Type ***=b12*e5*** and press **Enter.**

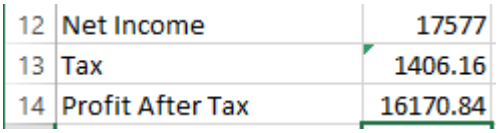


5	Income		Tax Rate:	8%
6	Backpack	2886		
7	Tent with screen room	6345		
8	Knee pads	5334		
9	Mountain bike	7597		
10	Total Income	22162		
11	Expenses	4585		
12	Net Income	17577		
13	Tax	=b12*e5		

c) Observe that the tax was calculated by multiplying the net income with the tax rate that is displayed in cell E5.

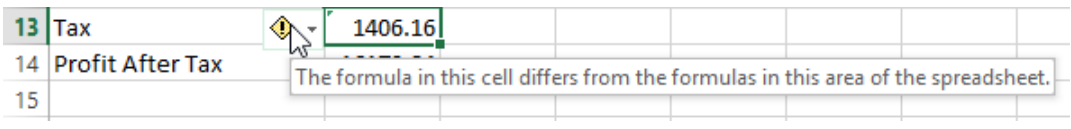
d) In cell B14, calculate the profit after tax by deducting the tax in cell B13 from the net income in cell B12.

e) Examine cell B13. A green triangle is displayed in the top-left corner of the cell because Excel recognizes this formula to be different than the other formulas in the column.



12	Net Income	17577
13	Tax	1406.16
14	Profit After Tax	16170.84

f) Select cell **B13** and then select the **Error Checking** button.



g) From the menu, select **Ignore Error.**
h) Examine cell B13, and verify that the green triangle is no longer displayed.

10	Total Income	22162
11	Expenses	4585
12	Net Income	17577
13	Tax	1406.16
14	Profit After Tax	16170.84

4. Save the file as ***My New Product Income*** and close the workbook.
a) Select **FILE→Save As,** and under **Computer,** in the **Current Folder** section, select **Performing Calculations**.
b) In the **Save As** dialog box, in the **File name** text box, type ***My New Product Income*** and select **Save.**
c) Close the workbook.

TOPIC B

Insert Functions in a Worksheet

In the last topic, you created formulas in worksheets. Another way to calculate data in Excel is to use mathematical functions. In this topic, you will insert functions in a worksheet.

Creating formulas enables you to perform simple and complex calculations in your worksheets, but there are some calculations that can be difficult to create, while others are used so often that it can become tedious to create the formula each time that you need to use it. By taking advantage of the built-in functions provided in Excel, you can perform a variety of calculations to analyze your data.

Functions

A *function* is a built-in Excel formula that you can use to perform calculations in your worksheets. Functions always begin with an equal sign, and they also contain a function name, followed by *arguments* within parentheses. The function name is usually an abbreviated name of the function. Arguments can be cell references, constants, formulas, other functions, or logical values. When referencing other cells, functions use a comma (**,**) to separate individual cells, while a colon (**:**) denotes a range between two cells (inclusive).

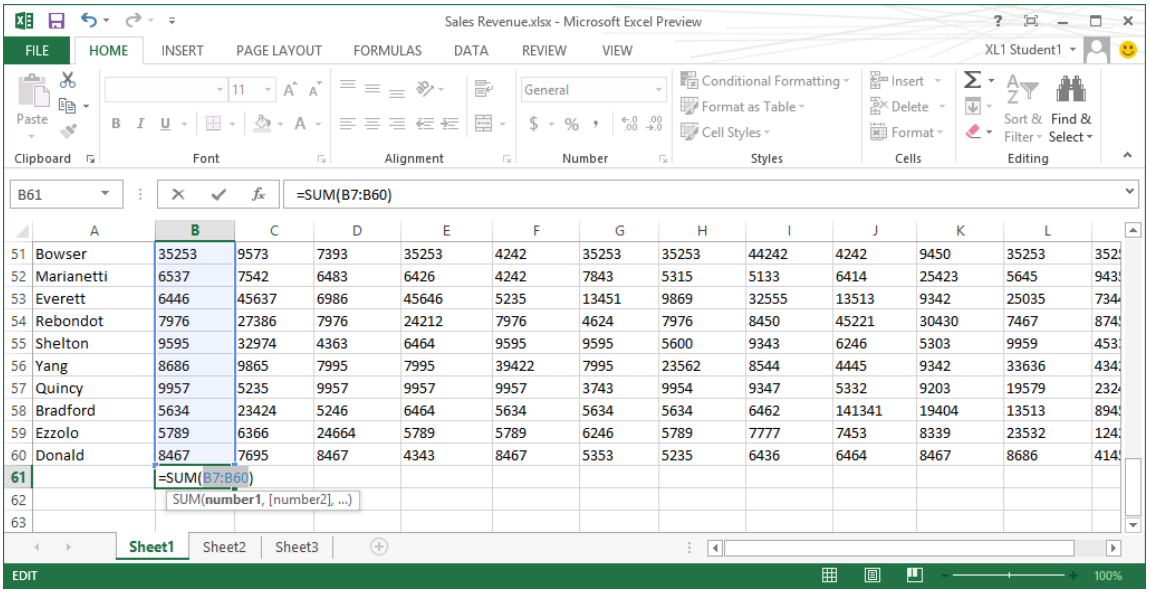


Figure 1-4: The SUM function with arguments displayed.

The Function Library

The **FORMULAS** tab includes a **Function Library** group. This group provides easy access to the functions that are available in Excel because it divides the functions into categories for ease of reference.

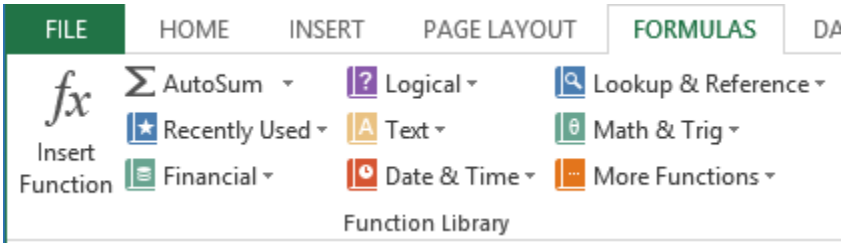


Figure 1-5: The Function Library.

From within each category, the **Function Library** also provides access to the **Insert Function** dialog box, which you can use to search for the function that will best suit the task at hand.

Category	*Description*
Financial	Use these functions to perform common business calculations, such as determining the repayment for a loan, the future value or net present value of an investment, or a schedule of cash flow.
Logical	Use these functions to determine if a condition is true or false, or if other logical conditions are met.
Text	Use these functions to change text values.
Date & Time	Use these functions to incorporate date and time information in your calculations.
Lookup & Reference	Use these functions to find values in a list or table, or when you need to find a reference to a cell.
Math & Trig	Use these functions to perform mathematical calculations.
Statistical	Use these functions to perform analysis on data. This category includes the average, highest and lowest values, median, standard deviation, and other statistics functions.
Engineering	Use these functions to perform engineering analysis.
Cube	Use these functions to analyze the contents of a database to learn more about a business. This category represents sets of data derived from raw information stored in a standard database.
Information	Use these functions to return cell information, including the formatting, location, and contents of a cell.
Compatibility	Use this category to create spreadsheets that are compatible with older versions of Excel.
	Caution: All of the functions in this category have been replaced with functions that might offer a greater level of accuracy and that have been renamed to reflect their usage more closely. These functions are primarily included to provide backward compatibility; you should consider using the newer functions in the Statistical category whenever possible.
Database	Use these functions to query data that is contained in a worksheet. You can then perform calculations on records that meet the specified criteria.

Common Functions in Excel

The **Function Library** also includes the **AutoSum** button. This button enables you to quickly insert commonly used functions into a worksheet.

The functions that you can insert by using the **AutoSum** button provide basic mathematical and statistical analysis functionality.

Function	*Use To*
Sum	Add the values specified in the argument.
Average	Calculate the average of the values specified in the argument.
Count numbers	Find the number of cells that contain numerical values in the specified range in the argument.
Max	Find the highest of the values specified in the argument.
Min	Find the lowest of the values specified in the argument.

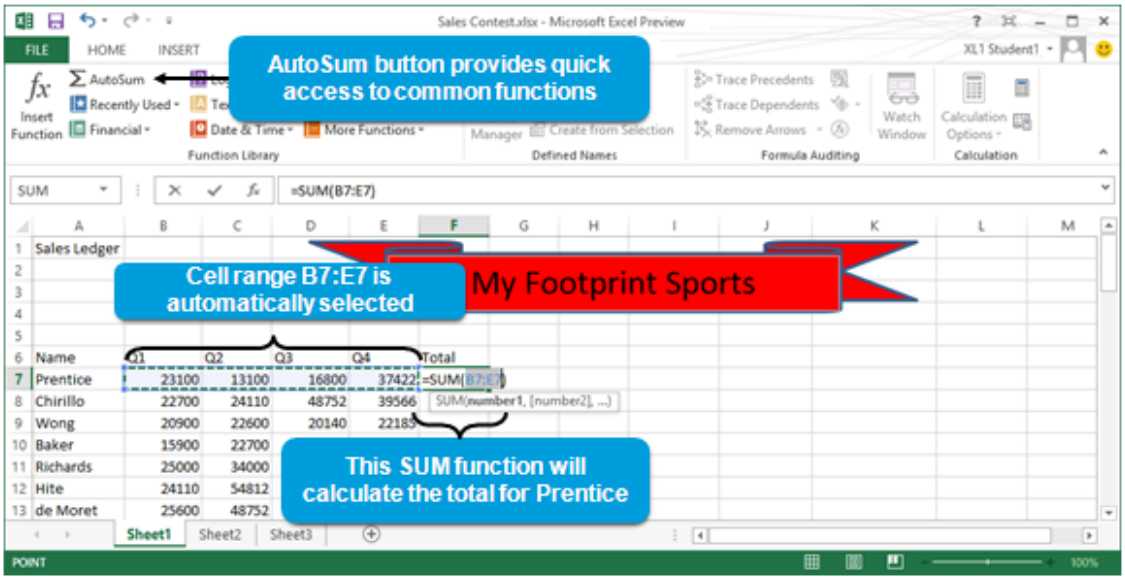

AutoSum button provides quick access to common functions
Cell range B7:E7 is automatically selected
My Footprint Sports
This SUM function will calculate the total for Prentice

Figure 1-6: Using the AutoSum button.

The AutoSum Button

For ease of access, the **AutoSum** button is also displayed on the **HOME** tab, in the **Editing** group.

The Formula AutoComplete Feature

The Formula AutoComplete feature is a dynamic feature that enables you to select and enter functions without having to remember lengthy function names or risking a spelling error. When you type the equal sign and the first few characters in a function's name, Excel displays a drop-down list with all the available function names that begin with the characters you typed. You can select the required function from the list and then enter the necessary arguments to complete the entry of the formula.

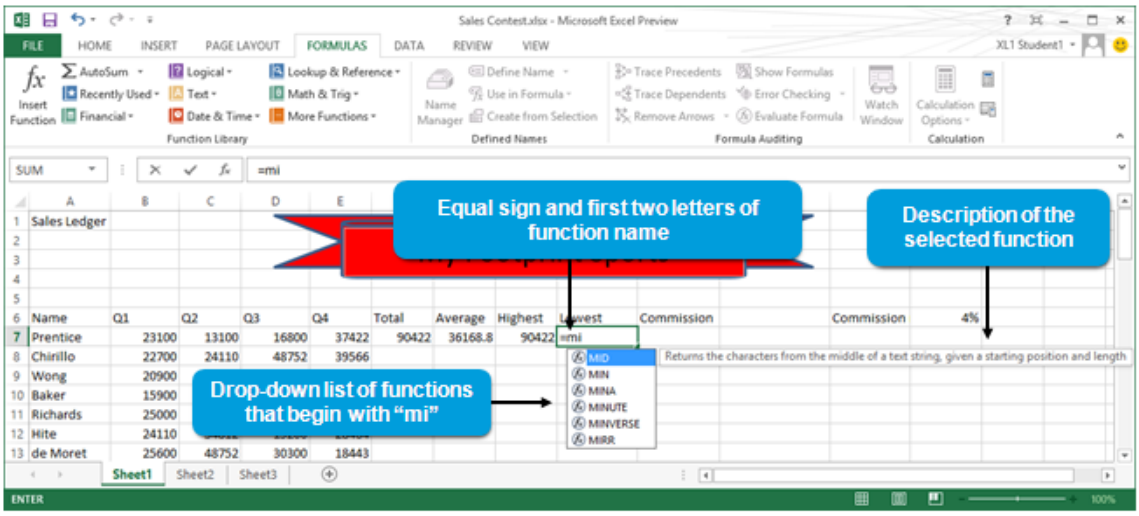

Equal sign and first two letters of function name
Description of the selected function
Drop-down list of functions that begin with "mi"
Returns the characters from the middle of a text string, given a starting position and length

Figure 1-7: The Formula AutoComplete feature displays functions that begin with the characters you enter.

How to Insert Functions in a Worksheet

Here are the general steps you will use to insert functions in a worksheet.

Enter a Function into a Worksheet by Using the Formula AutoComplete Feature

To enter a function into a worksheet by using the Formula AutoComplete feature:

1. Select the cell in which you want to enter a formula.
2. Type the equal sign and the first few letters of the function's name.
3. In the AutoComplete list, double-click a function to enter the formula.
4. Specify the arguments for the function.
5. Press **Enter** to complete the function.

Enter a Function into a Worksheet by Using the Function Library

To enter a function into a worksheet by using the **Function Library**:

1. Select the cell in which you want to enter a formula.
2. Select the **FORMULAS** tab to display the **Function Library.**
3. Identify the category that contains the function that you want to use, and then select the corresponding button.
4. From the drop-down list, select the function to include in the selected cell.
5. In the **Function Arguments** dialog box, specify the arguments for the function, preview the formula result, and select **OK.**

Enter a Function into a Worksheet by Using the Insert Function Dialog Box

To enter a function into a worksheet by using the **Insert Function** dialog box:

1. Select the cell in which you want to enter a formula.
2. On the **FORMULAS** tab or on the **Formula Bar,** select the **Insert Function** button.
3. In the **Search for a function** text box, type a brief description of what you need to accomplish and then select **Go.**
4. If necessary, in the **Or select a category** drop-down list, select a category.
5. In the **Select a function** list box, select a function and select **OK.**
6. In the **Function Arguments** dialog box, specify the arguments for the function, preview the formula result, and select **OK.**

Perform Calculations by Using the AutoSum Button

To perform calculations by using the **AutoSum** button:

1. Enter the values that you want to calculate into a series of cells.
2. Select the cell where you want the result to be displayed.
3. If you want to apply the SUM function, on the **HOME** or **FORMULAS** tab, select the **AutoSum** button.
4. If you want to apply another function, on the **HOME** or **FORMULAS** tab, display the **AutoSum** drop-down list, and select a function.
5. In the formula, verify that the selected range of cells is accurate, and press **Enter.**
6. If Excel does not automatically select the desired range, drag the selection to the range of cells that you want to calculate, and then press **Enter.**

ACTIVITY 1-2

Inserting Functions in a Worksheet

Data Files

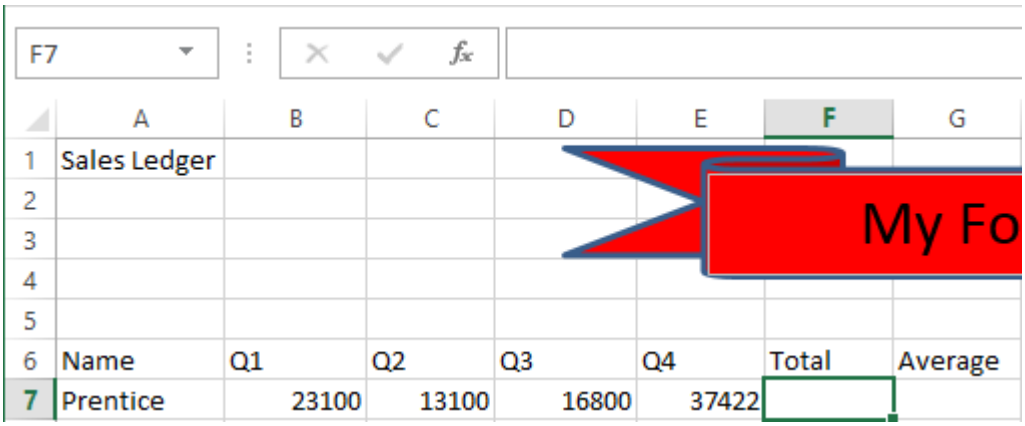
C:\091014Data\Performing Calculations\Sales Contest.xlsx

Scenario

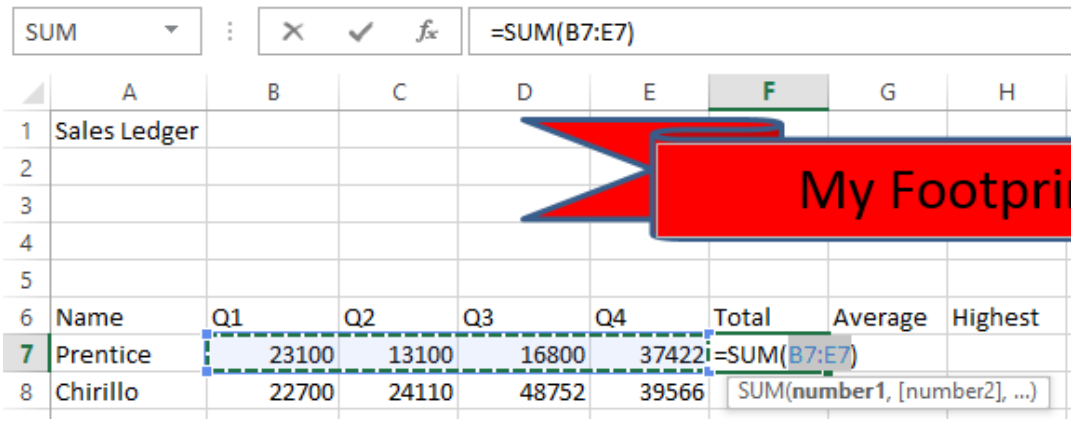
To analyze the sales performance of two employees, Del Prentice and Christina Chirillo, for the past year, you decide to calculate the total and average sales they made. You also want to find the highest and lowest sales for each salesperson for the year, to recognize and reward the best performer.

---

1. In the **Sales Contest.xlsx** worksheet, calculate the total sales for Del Prentice and Christina Chirillo for the past year.
   a) Open the file **C:\091014Data\Performing Calculations\Sales Contest.xlsx.**
   b) Select cell **F7.**



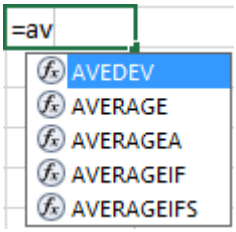
   c) Select **HOME→Editing→AutoSum.**
   d) Verify that the cell range **B7:E7** is selected in the worksheet and displayed in the cell and the **Formula Bar.**



   e) Press **Enter** to display the total sales by Del Prentice for Q1 through Q4.

f) Calculate the total sales by Christina Chirillo for the same time period.

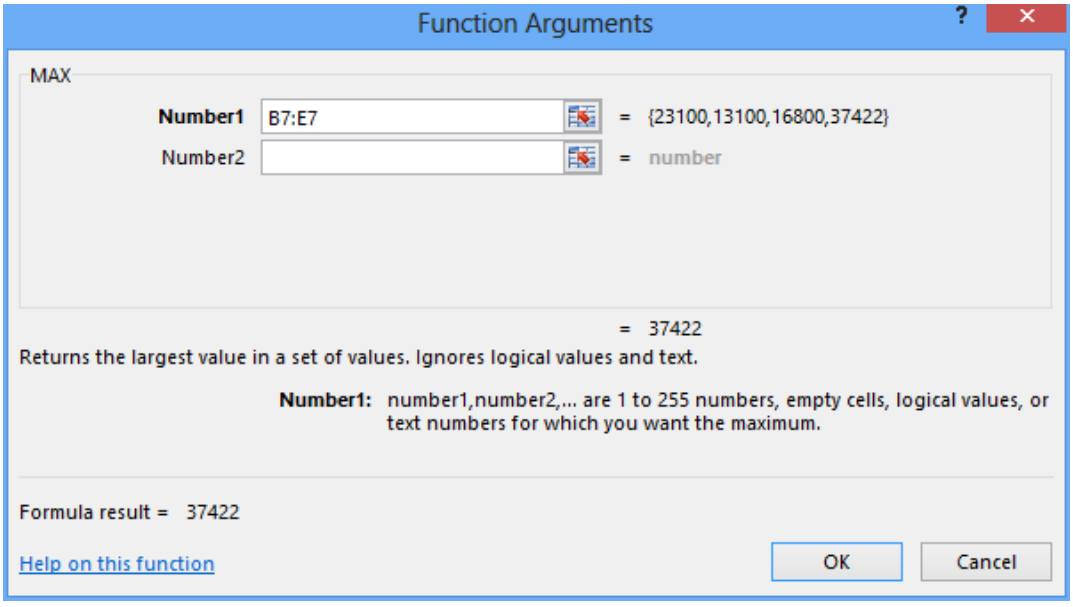
2. Calculate the average of sales by Del Prentice and Christina Chirillo.
   a) Select cell **G7** and type ***=av***



   b) From the AutoComplete list, double-click to select **AVERAGE.**
   c) In the worksheet, select the cell range **B7:E7** and press **Enter** to display Del Prentice's sales average for the last year.
   d) Calculate the average sales for Christina Chirillo for the same time period.

6	Name	Q1	Q2	Q3	Q4	Total	Average
7	Prentice	23100	13100	16800	37422	90422	22605.5
8	Chirillo	22700	24110	48752	39566	135128	33782

3. Calculate the highest sales quarter for Del Prentice and Christina Chirillo.
   a) Select cell **H7.**
   b) Select **FORMULAS→Function Library→Insert Function.**
   c) In the **Insert Function** dialog box, in the **Search for a function** text box, type **Max** and select **Go.**
   d) In the **Select a function** list box, verify that **MAX** is selected and select **OK.**
   e) In the **Function Arguments** dialog box, to the right of the **Number1** text box, select the **Collapse Dialog** button, and select the cell range **B7:E7.**
   f) In the **Function Arguments** dialog box, to the right of the **Number1** text box, select the **Expand Dialog** button, and then select **OK.**

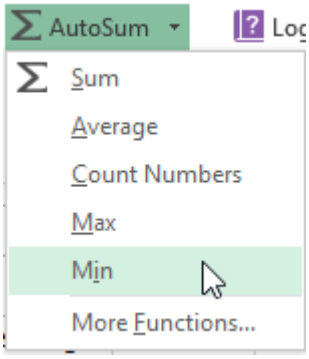

Function Arguments
MAX
Number1
B7:E7
= {23100,13100,16800,37422}
Number2
= number
= 37422
Returns the largest value in a set of values. Ignores logical values and text.
Number1: number1,number2,... are 1 to 255 numbers, empty cells, logical values, or text numbers for which you want the maximum.
Formula result = 37422
Help on this function
OK
Cancel

g) Use the **Insert Function** button in the **Formula Bar** to calculate the highest sales quarter for Christina Chirillo for the same time period.

4. Calculate the lowest sales quarter for Del Prentice and Christina Chirillo.

a) Select cell **I7.**

b) On the **FORMULAS** tab, in the **Function Library** group, select the **AutoSum** drop-down arrow, and from the drop-down list, select **Min.**



c) In the worksheet, select the cell range **B7:E7** and press **Enter** to display the lowest sales quarter for Del.

d) Calculate the lowest sales quarter for Christina Chirillo for the same time period.

	Name	Q1	Q2	Q3	Q4	Total	Average	Highest	Lowest
7	Prentice	23100	13100	16800	37422	90422	22605.5	37422	13100
8	Chirillo	22700	24110	48752	39566	135128	33782	48752	22700

5. Save the worksheet as ***My Sales Contest.xlsx***

a) Select **FILE→Save As,** and navigate to the **Current Folder.**

b) In the **Save As** dialog box, in the **File name** text box, type ***My Sales Contest*** and select **Save.**

TOPIC C

Reuse Formulas

In this lesson, you have performed calculations by creating formulas and inserting functions in a worksheet. In many instances, similar formulas can be required to calculate similar data, and Excel enables you to reuse many workbook elements, including formulas, to save time. In this topic, you will reuse formulas.

As you work with the data in an Excel worksheet, you might find that you need to use the same types of formulas and functions in other places within the worksheet. Entering these formulas and functions each time they are required can quickly become tedious. Excel enables you to copy formulas and functions and paste them in other cells so that you can reuse them more easily.

The Cut, Copy, and Paste Commands

In an Excel worksheet, you can move or copy cells or their contents. To move a cell or its contents, you can use the **Cut** and **Paste** commands. To copy a cell or its contents, you can use the **Copy** and **Paste** commands. The **Paste** commands also include a preview feature that enables you to view how the content will be displayed before you paste it into the worksheet.

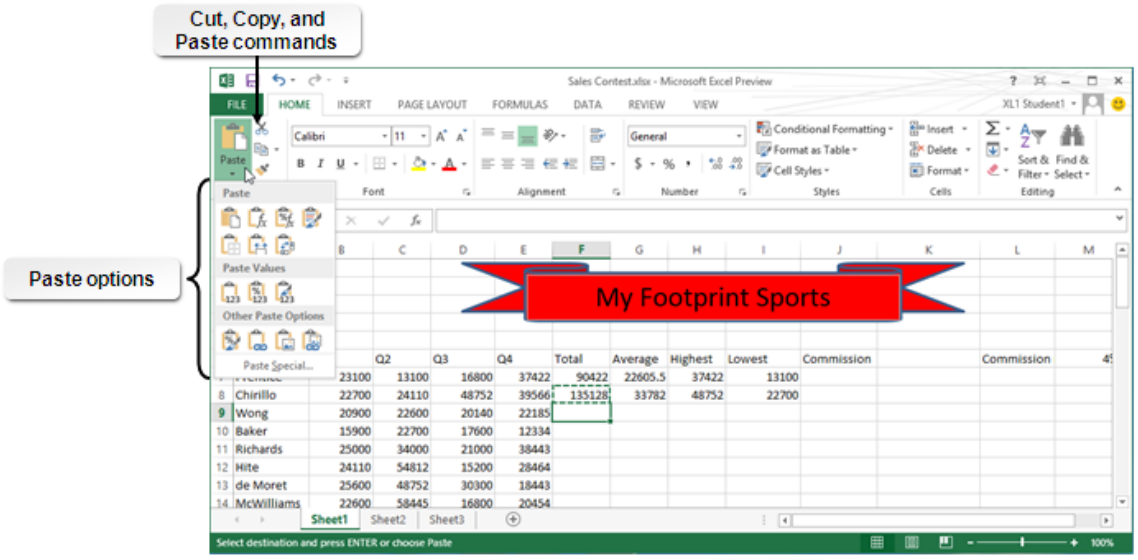


Figure 1-8: The Cut, Copy, and Paste commands enable you to reuse data and formulas.

Keyboard Shortcuts

The following table lists the keyboard combinations for the **Cut, Copy,** and **Paste** commands.

Command	*Keyboard Combination*
Cut	**Ctrl+X**
Copy	**Ctrl+C**
Paste	**Ctrl+V**

Paste Special Options

You can use the **Paste Special** options to copy and paste specific cell contents or attributes, such as formats, formulas, or values. By selecting the appropriate **Paste Special** option, you can reuse specific properties of the selected cell in other areas of the worksheet.

The **Paste** drop-down arrow provides several **Paste Special** options, each of which is represented by an icon. When you place the mouse pointer over an icon, you can preview how the pasted content will look in the worksheet. You can also access other **Paste Special** options from the **Paste Special** dialog box by selecting **Paste Special** from the bottom of the **Paste Special** menu.

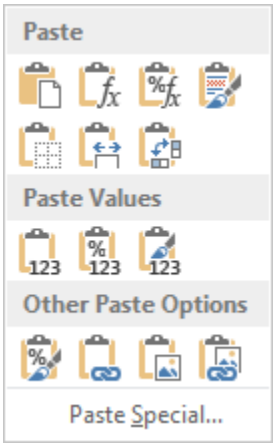


Figure 1-9: Paste Special options.

Paste Special Option	*Description*
Paste All	Pastes the content, including all text, values, formulas, and formatting.
Paste Formulas	Pastes all text, values, and formulas in the current selection, but not the format of the source cell.
Paste Values	Pastes the calculated value of the formula used in the source cell.
Paste Formats	Pastes only the formatting applied to the source cell.
Paste Comments	Pastes only the comments that are attached to the source cell.
Paste Validation	Pastes only the data validation rules that are applied to the source cell.
Paste All using Source theme	Pastes the content, including all text, values, formulas, and cell styles.
Paste All except borders	Pastes the cell content without any borders if the source cell had any borders.
Paste Column widths	Pastes the content and keeps the column width the same as the source cell.
Paste Formulas and number formatting	Pastes the content with the number formats and formulas.
Paste Values and number formatting	Pastes the calculated value of the formula used in the source cell along with the number formatting.
Paste All merging conditional formats	Pastes the content, including all text, values, formulas, and formatting, including any conditional formatting that is applicable.

Paste Special Option	Description
Operations	Pastes the results of the mathematical calculations based on the value of the source and destination cells. **None** means that Excel will not perform any mathematical operation on the source and destination cells; **Add** adds the values of the source and destination cells; **Subtract** finds the difference between the source and destination cell (destination - source); **Multiply** finds the product of the source and destination cells; and **Divide** divides the value of the source cell by the value of the destination cell.
Skip blanks	Pastes only from cells that are not empty.
Transpose	Pastes the source content in a different orientation. For example, if you copy all or part of a column, selecting **Transpose** pastes the cells across a row.
Paste as Link	Pastes a reference to the source cell so that the value of the destination cell is linked to the value of the source cell. If the source cell is changed, the change will be reflected in the destination cell.

Relative References

A *relative reference* is a cell reference in a formula that changes when the formula is copied from one cell to another. The change to the cell reference is based on the new position of the formula. By default, cell references are relative.

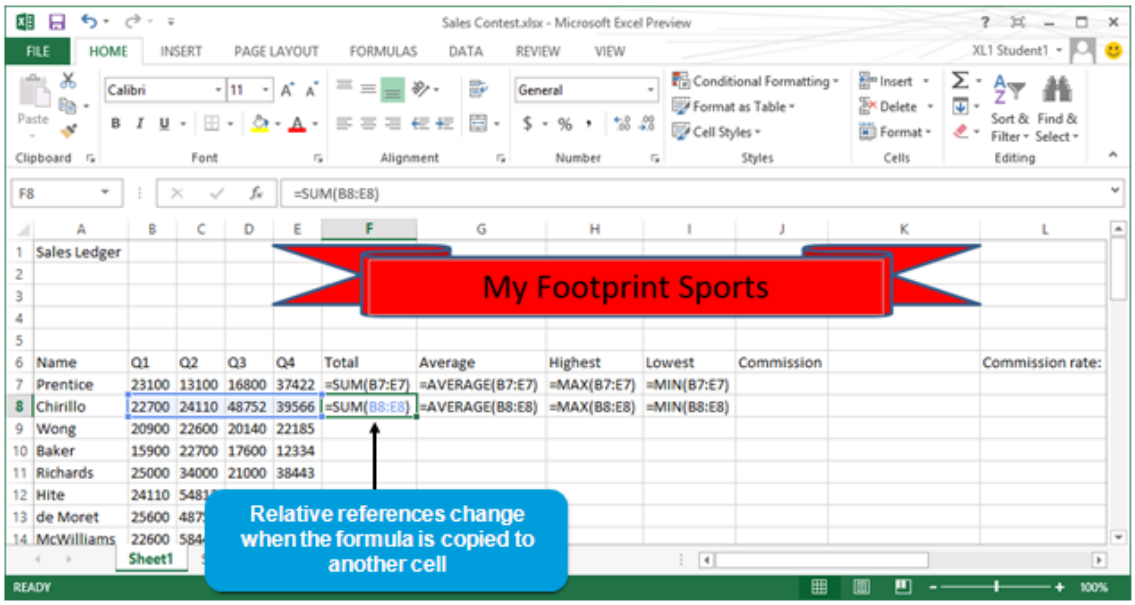
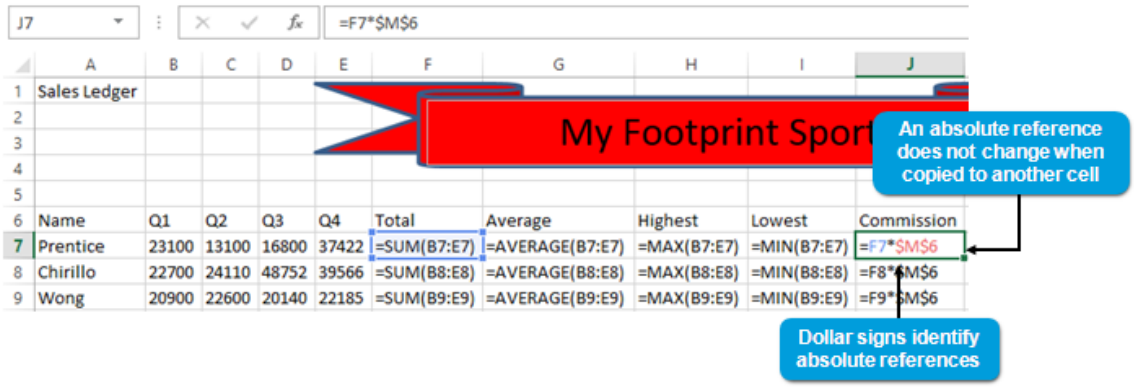


Figure 1-10: Relative references change when you copy a formula to another cell.

Absolute References

An *absolute reference* is a cell reference in a formula that does not change when the formula is copied from one cell to another. Absolute references contain a dollar sign before the column and row designations in the cell reference. You can use absolute references in formulas when you need to refer to values in cells that should not change in relation to the cells where the result is to be stored.

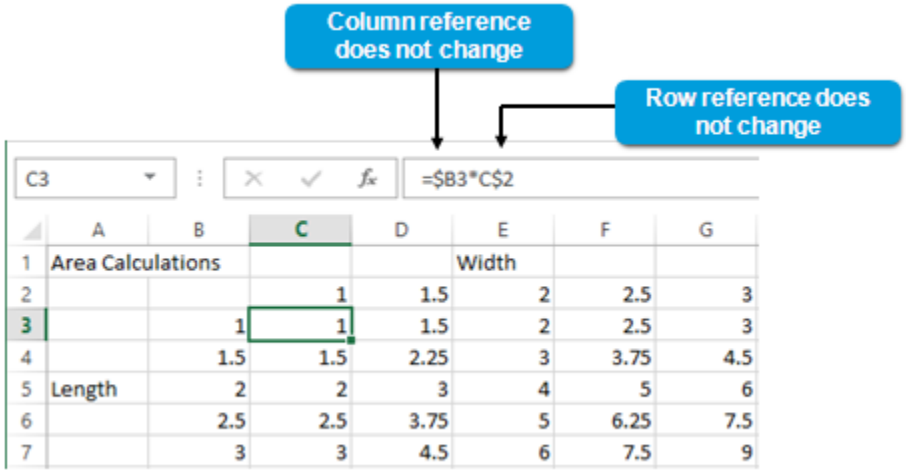


	A	B	C	D	E	F	G	H	I	J
1	Sales Ledger									
2										
3										
4										
5										
6	Name	Q1	Q2	Q3	Q4	Total	Average	Highest	Lowest	Commission
7	Prentice	23100	13100	16800	37422	=SUM(B7:E7)	=AVERAGE(B7:E7)	=MAX(B7:E7)	=MIN(B7:E7)	=F7*$M$6
8	Chirillo	22700	24110	48752	39566	=SUM(B8:E8)	=AVERAGE(B8:E8)	=MAX(B8:E8)	=MIN(B8:E8)	=F8*$M$6
9	Wong	20900	22600	20140	22185	=SUM(B9:E9)	=AVERAGE(B9:E9)	=MAX(B9:E9)	=MIN(B9:E9)	=F9*$M$6

Figure 1-11: Absolute references do not change when they are copied to another cell.

Mixed References

A *mixed reference* is a cell reference that contains a mix of absolute and relative references. When a formula with a mixed reference is copied from one cell to another, the relative portion of the cell reference changes, while the absolute portion of the cell reference does not change. Mixed references contain a dollar sign before either the column or the row reference, depending on whether the column or row designation should not change.



	A	B	C	D	E	F	G
1	Area Calculations				Width		
2			1	1.5	2	2.5	3
3		1	1	1.5	2	2.5	3
4		1.5	1.5	2.25	3	3.75	4.5
5	Length	2	2	3	4	5	6
6		2.5	2.5	3.75	5	6.25	7.5
7		3	3	4.5	6	7.5	9

Figure 1-12: Mixed references enable you to keep the same row or column reference when a formula is copied.

How to Reuse Formulas

Here are the general steps you will use to reuse formulas in worksheets.

Copy a Formula or Function

To copy a formula or function:

1. Select the cell that contains the formula you want to copy.
2. Select **HOME→Clipboard→Copy.**
3. Select the destination cell where you want to paste the formula.
4. Select **HOME→Clipboard→Paste.**

Create an Absolute Reference

To create an absolute reference:

1. Select the cell with the formula that needs to refer to constant cell values.
2. On the **Formula Bar,** activate the formula text box and type a dollar sign in front of the column and row references to make the cell reference constant in the formula. Or, press **F4** to add the dollar sign to the column and row references.
3. Press **Enter** to apply the change made to the formula.

ACTIVITY 1-3
Reusing Formulas

Before You Begin
My Sales Contest.xlsx is open.

Scenario
You need to complete the analysis of the performance of all sales personnel for an upcoming meeting. During that meeting, you will also need to provide information on the commission earned by each member of the Sales team. For each employee, the formula for calculating the commission should refer to the commission-rate value specified in the worksheet.

---

1. Calculate the total and average sales for the remaining employees.
   a) Select cell **F8.**
   b) Select **HOME→Clipboard→Copy.**
   c) Verify that cell F8 has a dotted rectangle around it. This indicates that the cell contents have been copied.
   d) Select the cell range **F9:F30.**
   e) Select **HOME→Clipboard→Paste.**
   f) Verify that the total sales for the remaining employees are calculated and displayed.

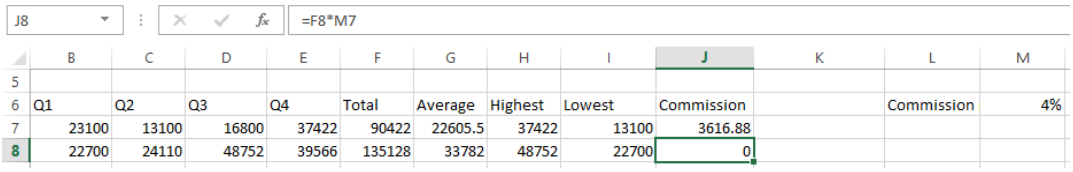
	A	B	C	D	E	F
5						
6	Name	Q1	Q2	Q3	Q4	Total
7	Prentice	23100	13100	16800	37422	90422
8	Chirillo	22700	24110	48752	39566	135128
9	Wong	20900	22600	20140	22185	85825
10	Baker	15900	22700	17600	12334	68534
11	Richards	25000	34000	21000	38443	118443
12	Hite	24110	54812	15200	28464	122586
13	de Moret	25600	48752	30300	18443	123095
14	McWilliams	22600	58445	16800	20454	118299
15	Howard	22700	48648	36855	29430	137633
16	Silvis	23300	24600	21380	42204	111484
17	Morris	23800	27700	12600	17790	81890
18	Lewis	54826	59224	24100	23667	161817
19	Jefferson	31200	23100	17700	34210	106210
20	Patrino	50224	17300	15200	27330	110054
21	Trowns-Hale	15500	19000	30300	34482	99282
22	Nguyen	30900	24400	16800	29843	101943
23	Johnsen	14815	13100	11580	15590	55085
24	OBrien	24500	25600	22000	38843	110943
25	Tantalo	20900	22600	20140	29466	93106
26	Parker	15900	22700	17600	39003	95203
27	Blaisedell	25000	34000	21000	27443	107443
28	Capuano	24110	54812	15200	19940	114062
29	Nihil	25600	48752	30300	29465	134117
30	Arthur	22600	58445	16800	34330	132175

g) Select cell **G8** and copy the contents of the cell.
h) Select the cell range **G9:G30.**
i) Paste the contents of the Clipboard.

2. Calculate the highest and lowest sales quarters for the remaining employees.
a) Copy the formula in cell **H8** to the range **H9:H30.**
b) Copy the formula in cell **I8** to the range **I9:I30.**

	A	B	C	D	E	F	G	H	I
5									
6	Name	Q1	Q2	Q3	Q4	Total	Average	Highest	Lowest
7	Prentice	23100	13100	16800	37422	90422	22605.5	37422	13100
8	Chirillo	22700	24110	48752	39566	135128	33782	48752	22700
9	Wong	20900	22600	20140	22185	85825	21456.25	22600	20140
10	Baker	15900	22700	17600	12334	68534	17133.5	22700	12334
11	Richards	25000	34000	21000	38443	118443	29610.75	38443	21000
12	Hite	24110	54812	15200	28464	122586	30646.5	54812	15200
13	de Moret	25600	48752	30300	18443	123095	30773.75	48752	18443
14	McWilliams	22600	58445	16800	20454	118299	29574.75	58445	16800
15	Howard	22700	48648	36855	29430	137633	34408.25	48648	22700
16	Silvis	23300	24600	21380	42204	111484	27871	42204	21380
17	Morris	23800	27700	12600	17790	81890	20472.5	27700	12600
18	Lewis	54826	59224	24100	23667	161817	40454.25	59224	23667
19	Jefferson	31200	23100	17700	34210	106210	26552.5	34210	17700
20	Patrino	50224	17300	15200	27330	110054	27513.5	50224	15200
21	Trowns-Hale	15500	19000	30300	34482	99282	24820.5	34482	15500
22	Nguyen	30900	24400	16800	29843	101943	25485.75	30900	16800
23	Johnsen	14815	13100	11580	15590	55085	13771.25	15590	11580
24	OBrien	24500	25600	22000	38843	110943	27735.75	38843	22000
25	Tantalo	20900	22600	20140	29466	93106	23276.5	29466	20140
26	Parker	15900	22700	17600	39003	95203	23800.75	39003	15900
27	Blaisedell	25000	34000	21000	27443	107443	26860.75	34000	21000
28	Capuano	24110	54812	15200	19940	114062	28515.5	54812	15200
29	Nihil	25600	48752	30300	29465	134117	33529.25	48752	25600
30	Arthur	22600	58445	16800	34330	132175	33043.75	58445	16800

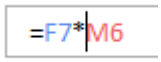
3. Calculate the commission for employees based on the commission rate found in cell **M6.**
   a) Select cell **J7,** type ***=F7*M6*** and press **Enter.**
   b) Copy the contents of cell **J7,** and paste them into cell **J8.**
   c) Select cell **J8,** and examine the **Formula Bar.**



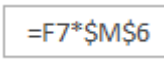
	B	C	D	E	F	G	H	I	J	K	L	M
5												
6	Q1	Q2	Q3	Q4	Total	Average	Highest	Lowest	Commission		Commission	4%
7	23100	13100	16800	37422	90422	22605.5	37422	13100	3616.88			
8	22700	24110	48752	39566	135128	33782	48752	22700	0			

   d) Observe that cell **J8** displays the value **0** because the formula used in the cell **J8** refers to cell **M7** for the commission rate, but the commission rate is stored in cell **M6.**

4. Modify the commission formula to use an absolute reference to the cell containing the commission rate.
   a) Select cell **J7,** and in the **Formula Bar** text box, place the insertion point before the **M.**



   b) Press **F4** to convert the cell reference to an absolute reference.
   c) Verify that the **Formula Bar** shows the cell reference with dollar signs in front of the row and column designations.



d) Press **Enter.**
e) Select cell **J7,** and copy the contents to the Clipboard.
f) Paste the contents of the Clipboard to cell **J8,** and verify that the cell now displays a number other than 0.
g) Select cell **J8,** and examine the formula in the **Formula Bar.** The cell reference for the commission rate is **$M$6.**
h) Paste the contents of the Clipboard in the cell range **J9:J30.**

5. Save and close the file.
a) On the **Quick Access Toolbar,** select the **Save** button to save the file with the same name and in the same location.
b) Close the workbook.

Summary

In this lesson, you learned about performing calculations in an Excel worksheet. By creating formulas and using the built-in Excel functions, you can perform a vast array of calculations quickly and with minimal errors.

Which functions do you expect to use most often in your work environment?

What benefits will using the Formula AutoComplete feature provide to you?

Note: Check your LogicalCHOICE Course screen for opportunities to interact with your classmates, peers, and the larger LogicalCHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen you can also access available resources for a more continuous learning experience.

2 Creating Advanced Formulas

Lesson Time: 1 hour, 15 minutes

Lesson Objectives

In this lesson, you will:

- Apply range names.
- Use specialized functions.

Lesson Introduction

From your previous training and experience, you're familiar with the fundamentals of creating and using formulas in Microsoft® Office Excel® 2013. You know that formulas are the mathematical expressions you build by hand and functions are the mathematical expressions already built into Excel. But your needs are changing. You now have more complex data manipulation requirements that basic formulas and functions cannot address. You need a deeper understanding of the data your business is generating. Your ability to use the advanced formula techniques in this lesson will enable you to turn your worksheet data into the business information you need.

In this lesson, you will create advanced formulas.

TOPIC A

Apply Range Names

Imagine you work in a real estate office. Your colleague, Tomas, has taken an unexpected leave and is unreachable. You've been asked to fill in for Tomas. One of Tomas's clients has come to the office prepared to sign some paperwork. You open Tomas's file cabinet and see dozens of file folders, each with labels like "S15" or "D72" or "M21:N72." You start flipping through the file folders, frantically looking for the client's paperwork, but it's not obvious to you how Tomas has organized his files. The client has folded her arms and started tapping her foot.

Now take a look at these two formulas.

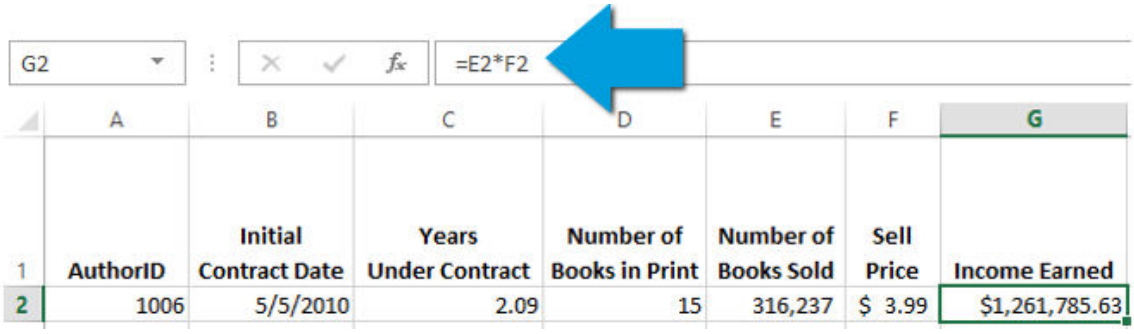


Figure 2-1: A worksheet that does not use range names.

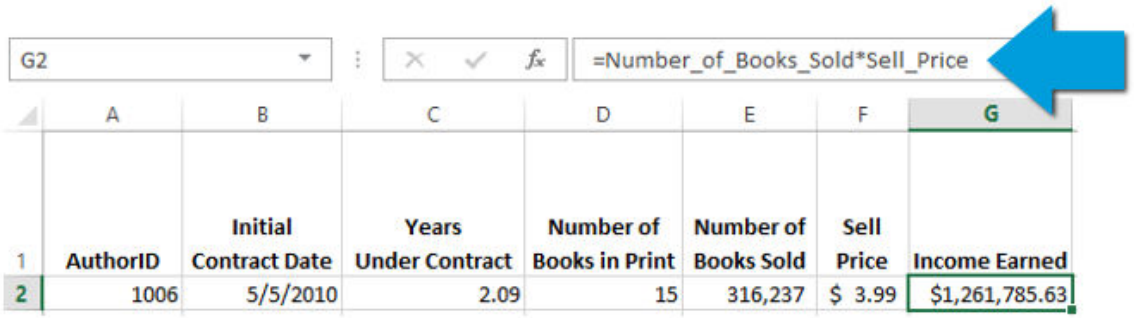


Figure 2-2: A worksheet that uses range names.

Which one is easier to understand? Which version would be easier to explain to a colleague or update two quarters from now? While both formulas will produce the exact same results, the first version uses cell references and the second version uses range names. When you master range naming by using the information in this topic, you'll be able to add this type of efficiency into your workbooks.

Range Names

A *range name* is a clear, concise, and descriptive name applied to a single cell or a range of cells. Naming ranges:

- Improves the readability and maintainability of formulas and functions.
- Reinforces the logic of formulas and functions for anyone who has to work with them.

The benefits of naming increase dramatically as your formulas and functions become more complex.

Range names:

- Must begin with a letter.
- Cannot include spaces.
- Can be up to 255 characters long.
- Can be limited in scope to either a single worksheet or to an entire workbook.
- Refer to absolute cell addresses.

How to Add Range Names

You can use these techniques to incorporate range names into your worksheets and workbooks.

Note: Access the **Checklist** tile in the LogicalCHOICE Course screen to view all How To procedures for this lesson.

Add a Range Name by Using the Name Box

To name a range by using the **Name** box:

1. Select the range you want to name.
2. In the **Name** box, type the name for the range.
3. Press **Enter**.

Add a Range Name by Using the New Name Dialog Box

To name a range by using the **New Name** dialog box:

1. Select the range you want to name.
2. Select **FORMULAS→Defined Names→Define Name**.
3. In the **New Name** dialog box, in the **Name** text box, type the range name.
4. From the **Scope** drop-down list, select either **Workbook** or a specific worksheet name.
   - Select **Workbook** if you want the range name to be unique across the entire workbook.
   - Select a specific worksheet name if you want the range name to be unique on that worksheet but available for use on other worksheets within the same workbook.
5. If desired, type a comment in the **Comment** text box. **Note**: Comments are additional descriptive text used to clarify what the range name is and does. Comments appear only in range-name-related dialog boxes—such as the Name Manager dialog box—and are not used in calculations.
6. Verify that the worksheet and range reference in the **Refers to** text box is correct.
7. Select **OK**.

Add a Range Name by Using Worksheet Data

To name a range by using worksheet data:

1. Verify that the top row, left column, bottom row, and/or right column of the range you want to name has a meaningful label.
2. Select the range you want to name, making sure you include the labeled top row, left column, bottom row, and/or right column in the selection. **Note**: This feature will only work for naming a range within a single row or column.
3. Select **FORMULAS→Defined Name→Create from Selection**.
4. In the **Create Names from Selection** dialog box, verify that the correct location of the labeled cell is selected.
5. Select **OK**.

ACTIVITY 2-1
Adding Range Names

Data Files
C:\091015Data\Creating Advanced Formulas\Author_Data.xlsx

Before You Begin
Open Excel 2013, if it is not open already.

Scenario
You work at Fuller & Ackerman Publishing (F&A). You have many Excel workbooks that you use to track various types of data. Right now, you're working with a workbook that tracks authors by the total number of years they've been contracted with F&A. This worksheet currently has six columns.

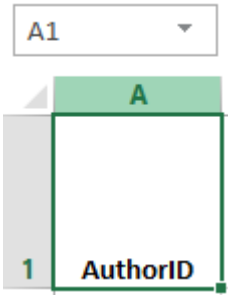
- **AuthorID**: A unique numerical ID for each author. The authors' names are tracked in a separate workbook.
- **Initial Contract Date**: The date the author signed her first contract with F&A. While every book or series by an author has its own unique contract, management likes to track the date an author signed her first contract with F&A.
- **Years Under Contract**: The current total number of years the author has been under contract since the initial contract was signed. Management creates incentive and loyalty-rewards programs for authors who continue their relationship with F&A. Some of the incentive and loyalty-rewards programs are based on the number of years the author has been publishing with the company.
- **Number of Books in Print**: The current total number of books the author has published since her initial contract date.
- **Number of Books Sold**: The current total number of books the author has sold since her initial contract date.
- **Sell Price**: The current price at which each book sells.

Your manager has asked you to provide information about income per author. You decide your best approach is to add a column that shows the total income earned by each author. Before adding the new column, you have decided to add range names to the worksheet to make the income earned formula (and other formulas you might add to this worksheet) easier to understand. You've already added the range names for the AuthorID column and the Initial Contract Date column. Now you're ready to add the range names for the remaining columns.

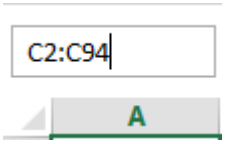
---

1. Open the file **Author_Data.xlsx**.

2. Use the **Name** box to add a range name for **Years Under Contract**.
   a) Select the **Name** box. This selects the contents of the **Name** box.



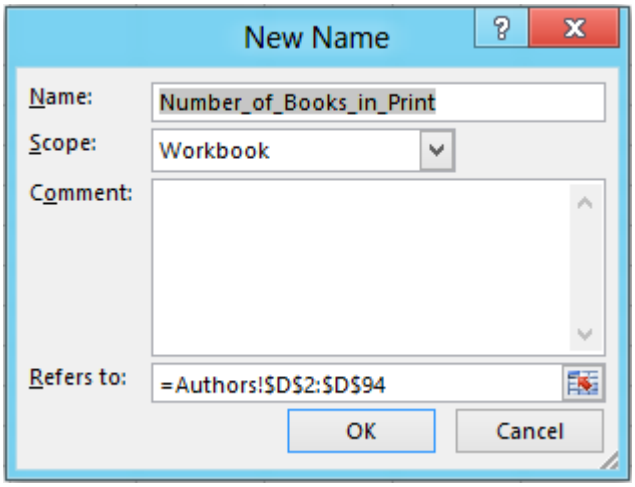
b) In the **Name** box, type ***C2:C94***



c) Press **Enter**. This selects the range C2:C94.
d) With the range C2:C94 selected, select the **Name** box.
e) In the **Name** box, type ***Years_Under_Contract***

f) Press **Enter**.

3. Use the **New Name** dialog box to add a range name for **Number of Books in Print**.
   a) Select the range **D2:D94**.
   b) To open the **New Name** dialog box, select **FORMULAS→Defined Names→Define Name**.



	Note: You could change this to any relevant name; however, for this exercise, you can leave the range name as Number_of_Books_in_Print.

   c) From the **Scope** drop-down list, select **Authors**. This constrains the new range name to the **Authors** worksheet, leaving the same range name available for use on other worksheets in this workbook.

d) Select **OK**.

e) Rename the Authors worksheet to ***Authors_Totals***

> **Note:** Remember that to rename a worksheet, you right-click the worksheet's tab, select **Rename**, type the new name, and then press **Enter**.

f) Select **FORMULAS→Defined Names→Name Manager**.

4. **What do you notice about the range reference at the bottom of this dialog box?**

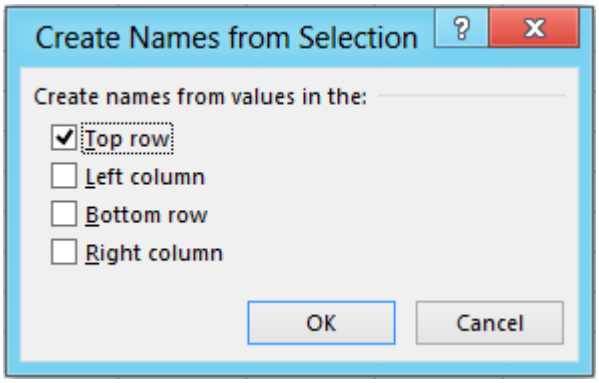
5. **What does this tell you about the relationship between range names and worksheet names?**

6. Select **Close**.

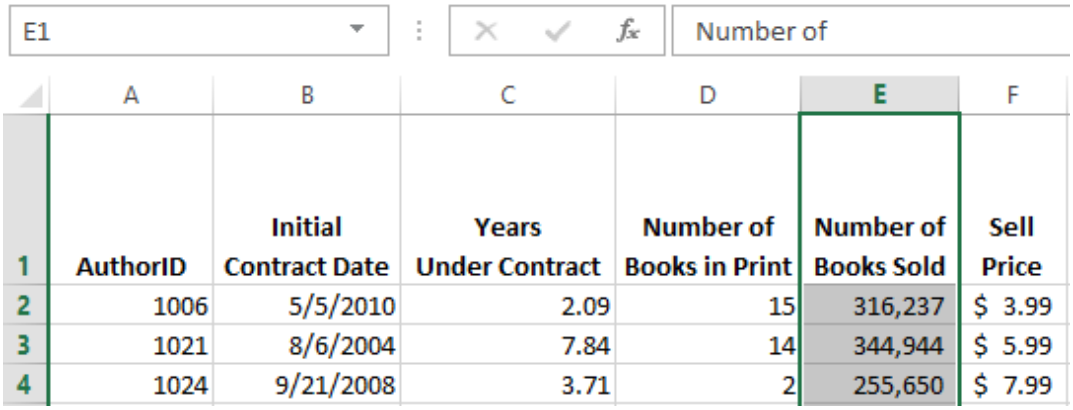
7. Use the **Number of Books Sold** label to add a range name for the number of books sold.

   a) Select the range **E1:E94**.

   b) To open the **Create Names from Selection** dialog box, select **FORMULAS→Defined Names→Create from Selection**.



   c) Verify that **Top row** is selected, and then select **OK**.



8. **Why does the Name box still say E1 instead of the range name Number_of_Books_Sold?**

9. By using your preferred method, add a range name for ***Sell Price.***

10. Save your work as ***My_Author_Data.xlsx*** in the **Creating Advanced Formulas** folder.

How to Edit Range Names

Sometimes you will need to make changes to your range names. This procedure enables you to edit range names as needed.

Edit a Range Name

To edit a range name:

1. Select **FORMULAS→Defined Names→Name Manager**.
2. In the **Name Manager** dialog box, in the list of names, double-click the range name you want to edit.
3. As necessary, in the **Edit Name** dialog box, edit the attributes of the range name. **Note**: The scope of a range name cannot be edited. If the scope is incorrect, delete the current range name by using the Name Manager delete functionality, and then re-create the range name with the correct scope.
4. Select **OK**.
5. In the **Name Manager** dialog box, select **Close**.

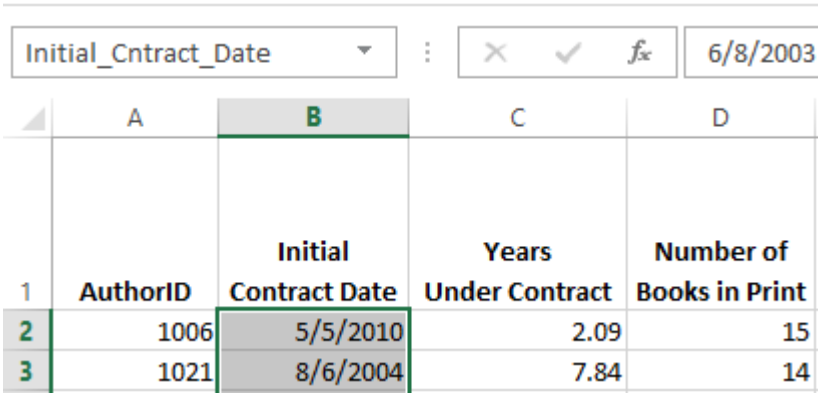
ACTIVITY 2-2
Editing a Range Name

Before You Begin
My_Author_Data.xlsx is open.

Scenario
You're continuing your updates to the file and realize that the **AuthorID** name is misspelled and the range name also refers to the incorrect range ($A$2:$A$24). You also notice that you need to correct the spelling of the **Initial Contract Date** range name.

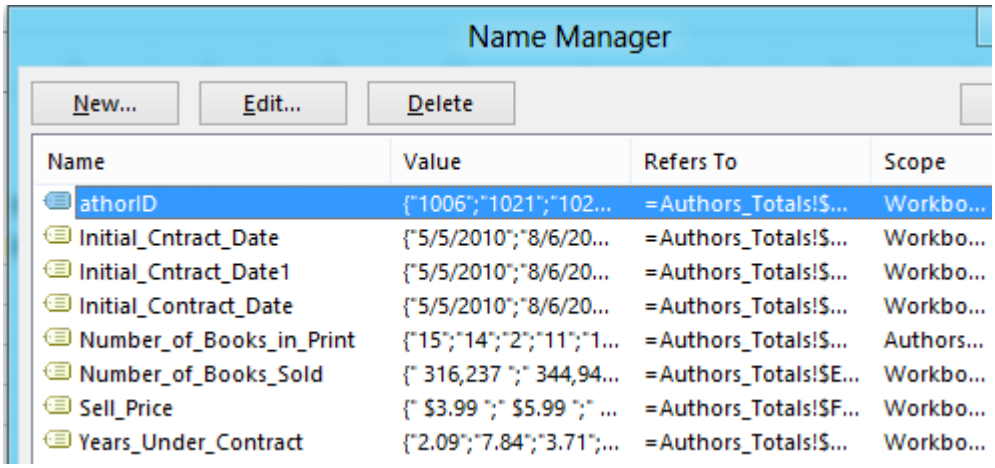
---

1. In **My_Author_Data.xlsx**, correct the spelling of the **Initial Contract Date** range name.
   a) Select the range **B2:B94**.



   b) Select the **Name** box.
   c) Type ***Initial_Contract_Date***
   d) Press **Enter.**

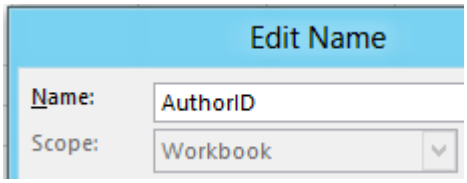
2. Verify that the range name has been corrected.
   a) Select **FORMULAS→Defined Names→Name Manager**.



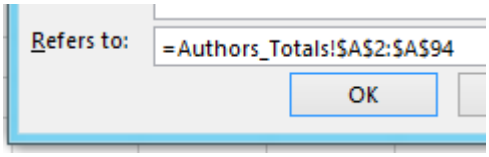
3. **What do you notice?**

4. **What does this tell you about using the Name box to edit range names ?**

5. Correct the spelling and range of the **AuthorID** range name.
   a) In the **Name Manager** dialog box, select **athorID**.
   b) Select **Edit**.
   c) In the **Name** text box, type ***AuthorID***



   d) In the **Refers to** text box, change **24** to ***94***



   e) Select **OK**.
   f) In the **Name Manager** dialog box, select **Close**.
   g) Save the file.

	Note: To edit the name of a range, you cannot use the **Name** box; you must use the **Name Manager** dialog box.

How to Delete Range Names

In cases where you need to delete a range name, you can follow this procedure.

Delete a Range Name

To delete a range name:

1. Select **FORMULAS→Defined Names→Name Manager**.
2. In the **Name Manager** dialog box, in the list of names, select the range name you want to delete.
3. Select **Delete**.
4. Select **OK**.
5. In the **Name Manager** dialog box, select **Close**.

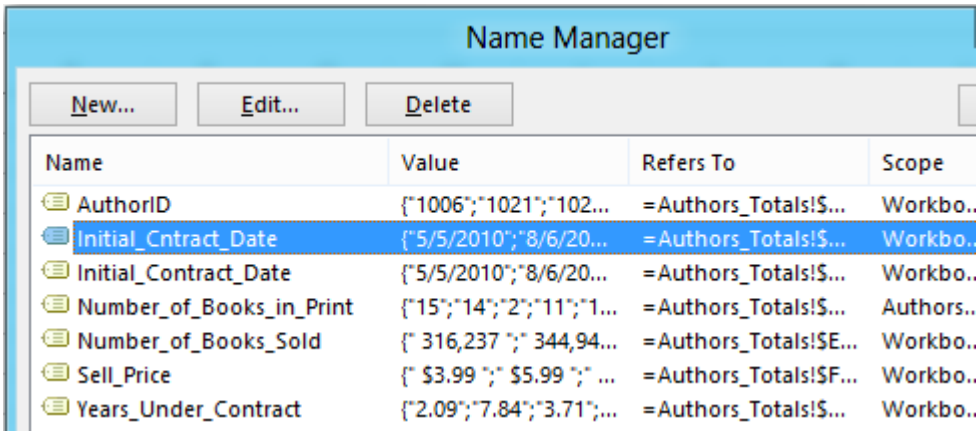
ACTIVITY 2-3
Deleting a Range Name

Before You Begin
My_Author_Data.xlsx is open.

Scenario
You do not want two versions of the Initial_Contract_Date range name in your file, so you have decided to delete the misspelled version.

---

1. In **My_Author_Data.xlsx,** delete the misspelled version of the **Initial_Contract_Date** range name.
   a) Select **FORMULAS→Defined Names→Name Manager** .



   b) In the **Name Manager** dialog box, select **Initial_Cntract_Date**
   c) Select **Delete**.
   d) In the Microsoft Excel dialog box, select **OK**.
   e) In the **Name Manager** dialog box, select **Close**.

2. Save your work.

How to Use Range Names in a Formula

The real power of range names comes when you incorporate them into your formulas.

Use a Range Name in a Formula

To use a range name in formula:

1. If necessary, add name ranges to the worksheet or workbook.
2. Select the cell that will contain the formula.
3. In the **Formula bar**, enter the formula by using range names rather than cell or range references.
   Note: When copying a formula that contains a range name, remember that range names contain absolute references, so the copied version will not be relative to its new location.
4. Press **Enter**.

ACTIVITY 2-4

Using Range Names in a Formula

Before You Begin

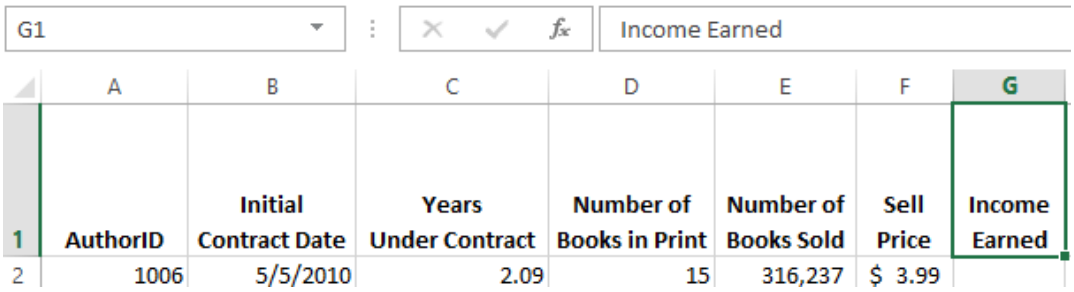
My_Author_Data.xlsx is open.

Scenario

Now that you've added the range names for each of the existing columns, you're ready to add a new column that totals each author's income earned. For the purposes of this spreadsheet, management defines income earned as the number of books sold multiplied by the sell price. To maintain consistency, you've decided to also add a range name for the data in the new column.

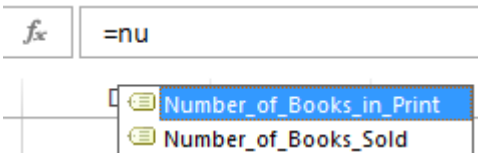
---

1. In **My_Author_Data.xlsx**, add a label for the new column and ensure it is formatted in the same style as the other columns.
   a) Select cell **G1**.
   b) Type ***Income Earned***

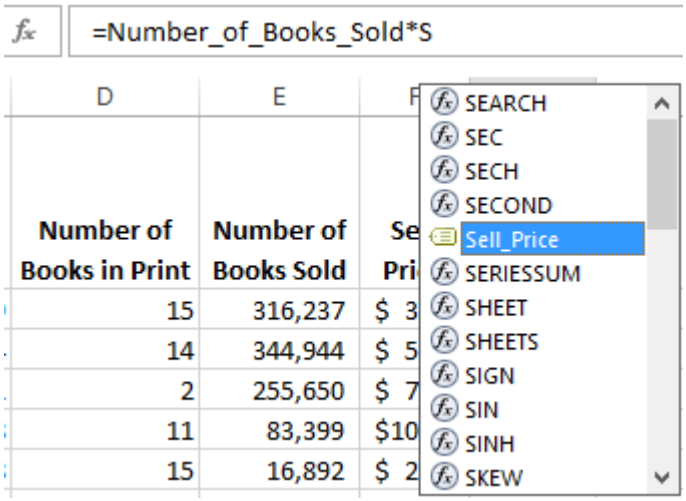


   c) Press **Enter**.

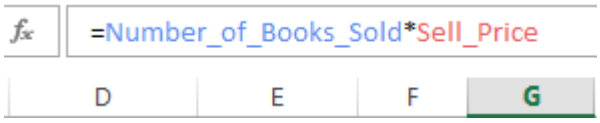
2. Use range names to write a formula that will calculate the income earned.
   a) If necessary, select cell **G2**.
   b) In the **Formula bar,** type ***=Nu***. As you type, Excel displays a list of functions and range names that match what you're typing.



   c) On the list, double-click **Number_of_Books_Sold**.
   d) In the **Formula bar**, after the range name, type *****
   e) After the asterisk, begin typing ***Sell_Price*** to display the list.

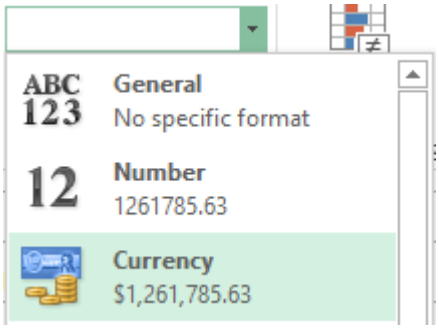


f) Double-click the range name **Sell_Price**.

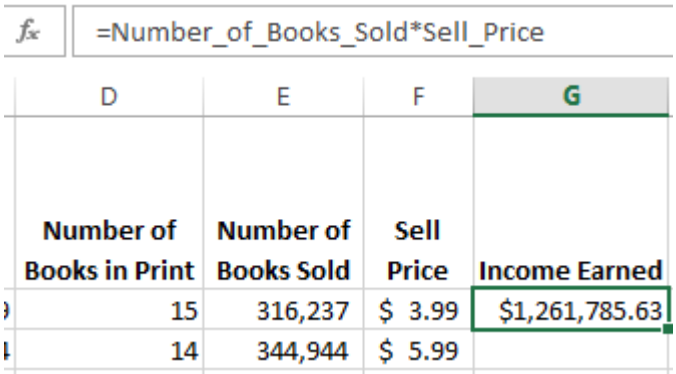


g) Press **Enter**.

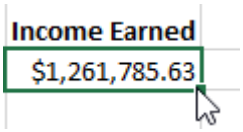
3. Format the income earned cell so that it appears as dollars.
   a) Select cell **G2**.
   b) Select **HOME→Number→Number Format down-arrow**, and then, from the drop-down list, select **Currency**.



c) If necessary, stretch the width of the column until the hash tags disappear and the value appears.



4. Copy the income earned formula for every author.
   a) If necessary, select cell **G2**.
   b) To instantly copy the formula to every relevant cell in column G, double-click the selection handle in the bottom right corner.



   c) To verify that the copy stopped at cell C94, press **Ctrl+ .** (the period key). This inverts the active cell in the selected range.
   d) Press **Ctrl + .** again to return to the top.

5. Set a range name for the Income Earned column.
   a) Select the range **G1:G94**.
   b) Select **FORMULAS→Defined Names→Create from Selection**.
   c) In the **Create Names from Selection** dialog box, select **OK**.

6. Save your work.

TOPIC B

Use Specialized Functions

Imagine you are a financial analyst and you want to calculate the internal rate of return (IRR) or the net present value (NPV) of a proposed project. Although it's beyond the scope of this course to explain how to calculate IRR and NPV, it's enough to say these are complex financial calculations.

Or, imagine you have a workbook that tracks project milestone dates for a complex project and you'd like to calculate the total number of workdays between two key milestones.

Either of these could be very time consuming to calculate if you have to calculate them by hand. Excel 2013 offers a more efficient way to make these, and many other, calculations.

In this topic, you will use specialized functions.

Function Categories

Excel has 13 categories of functions. Each category has a number of functions designed for very specific types of calculations.

You can access every function in the **Function Library** group on the **FORMULAS** tab.

Figure 2-3: The Function Library.

Financial, Logical, Text, Date & Time, Lookup & Reference, and **Math & Trig** functions each have their own button and drop-down list in the **Function Library**.

For example, here is the expanded list of **Logical functions**.

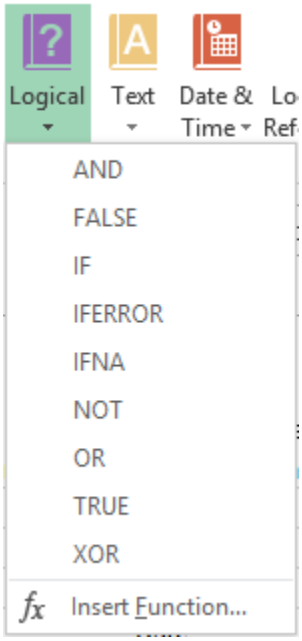


Figure 2-4: Logical functions.

The **More Functions** drop-down list provides access to the **Statistical, Engineering, Cube, Information**, and **Compatibility** functions.

Here are some of the many **Statistical** functions.

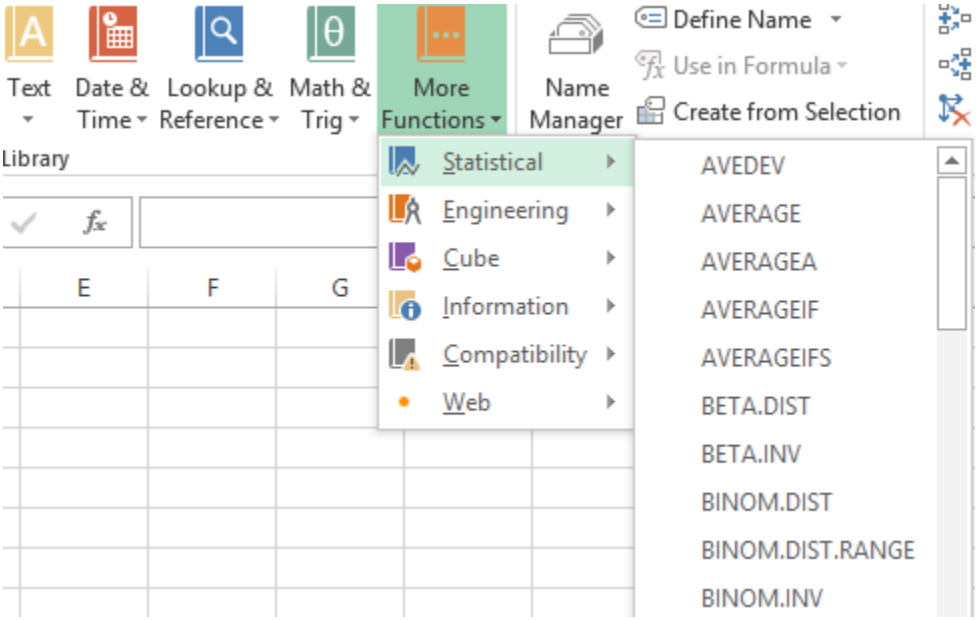


Figure 2-5: Statistical functions.

You can access any function by using the **Insert Function** button in the **Function Library**.

Category	Functions
Financial	Perform common financial calculations such as calculating the internal rate of return (IRR), net present value (NPV) or yield on a security.
Logical	Perform what-if and conditional analysis on data.
Text	Perform text manipulation. For example, you can convert text to lowercase or uppercase, or you can combine two or more bits of text from multiple cells into in a single cell.
Date & Time	Return date and time related information. For example, you could use a date function to return the current date.
Lookup & Reference	Find specific values in specific tables or lists of data.
Math & Trigonometry	Perform common mathematical and trigonometric calculations such as sine and cosine values or calculating the factorial of a number.
Statistical	Perform common statistical analysis such as finding the mean, median, or mode of a dataset.
Engineering	Perform engineering conversions. For example, if you want to convert a binary number to a hexadecimal, you would use one of the engineering functions.
Cube	Fetch data from Online Analytical Processing (OLAP) cubes. OLAP is a database technology used to analyze business data. For more information on OLAP support in Excel, see Excel Help.
Information	Provide information about data and worksheets. For example, if you want to know in which directory on your computer or network the current spreadsheet is stored, you would use one of the information functions.
Compatibility	Existed in previous versions of Excel but have been replaced in Excel 2013. While the older versions of the functions still work in Excel 2013, there are several important things to keep in mind. First, these functions may not be available in future versions of Excel. Second, each of these functions has a new, updated version in Excel 2013. However, if you update the function in an Excel 2013 file, and need to share the file with someone using a previous version of Excel, it's important to remember that the updated version of the function is not backwards compatible.
Database	Perform database-related operations on Excel data that meets specific criteria. Database functions can be a very powerful way to query the data in your spreadsheets.
User defined	Are not built-in to Excel's function library at the time of purchase. These functions come from add-ins that users install after purchasing Excel.

How to Locate Functions by Using the Excel Function Reference

Finding and using functions takes patience and practice. If you familiarize yourself with the function reference in the Excel Help system, you'll be better prepared to select the best functions for your needs.

Locate Functions by Using the Excel Function Reference

To locate functions by using the Excel function reference:

1. Open the Excel Help system.
2. In the **Search** box, type ***function categories***
3. Press **Enter.**
4. Select the **Excel functions (by category)** link.
5. Scan the list of functions for one that appears to meet your needs.
6. Select the name of the function and read its description to verify that the function will meet your needs.

ACTIVITY 2-5

Locating Functions by Using the Function Reference

Before You Begin

My_Author_Data.xlsx is open.

Scenario

Your manager has reviewed the spreadsheet and has asked that you add some updates. At a glance, she wants to know:

- The average number of books in print for the entire group of authors
- How long the newest author been has with the F&A family

You're sure Excel has functions that can address your manager's requests. However, you're not sure exactly which functions to use, so you decide to use the Excel Help system to locate the appropriate functions.

---

1. In **My_Author_Data.xlsx**, locate a function that will return the average number of books sold for the entire group of authors.
   a) Select the **Excel Help** ? button.
   b) In the **Search** text box, type ***function categories***
   c) Select **Search help**.
   d) Select the **Excel functions (by category)** link.
   e) If necessary, maximize your window.
   f) Scan the list of functions and locate one that you think will find the average value of a group of values.

2. **What functions did you find?**

3. Select the **AVERAGE function** link to open a description of the AVERAGE function. Every function in Excel has a page similar to this that explains what the function is, its arguments, and how it works. Many of these pages also include an example.

4. Read the description.

5. **Will the AVERAGE function work to meet the needs of your manager?**

6. Locate a function that will help you answer the question, “How long has the newest author been with the F&A family?”

   What does this aforementioned question suggest?

7. Close the **Excel Help** window, but keep Excel and your file open.

Function Syntax

Every function has a specific syntax. The *function syntax* describes the structure of the function, including the function's name, its arguments, the order of the arguments, and whether the arguments are required or not.

Note: It is good practice to verify a function's syntax in the function reference of the Excel Help system to ensure you are using all of the required arguments in the correct order.

Here's an example of the syntax of the AVERAGE function. This function has one required argument, number1, and can have one or more optional arguments of the same type, represented by [number2] and the ellipsis.

Syntax

```
AVERAGE(number1, [number2], ...)
```

The AVERAGE function syntax has the following arguments:

- **Number1** Required. The first number, cell reference, or range for which you want the average.
- **Number2, ...** Optional. Additional numbers, cell references or ranges for which you want the average, up to a maximum of 255.

Figure 2-6: Syntax of the AVERAGE function.

In Excel 2013's function reference, no matter which function syntax you are reviewing, all required arguments will not be bracketed, all optional arguments will be bracketed, and an ellipsis will represent multiple arguments of the same type.

Function Entry Dialog Boxes

You can enter functions by hand directly into the **Formula bar**, or you can use the two dialog boxes that simplify function entry: the **Insert Function** dialog box and the **Function Arguments** dialog box.

In the **Insert Function** dialog box you can search for a function by typing a brief description of what you want to do. You can also sort functions by category and select a specific function. A brief description of the selected function appears at the bottom of the dialog box.

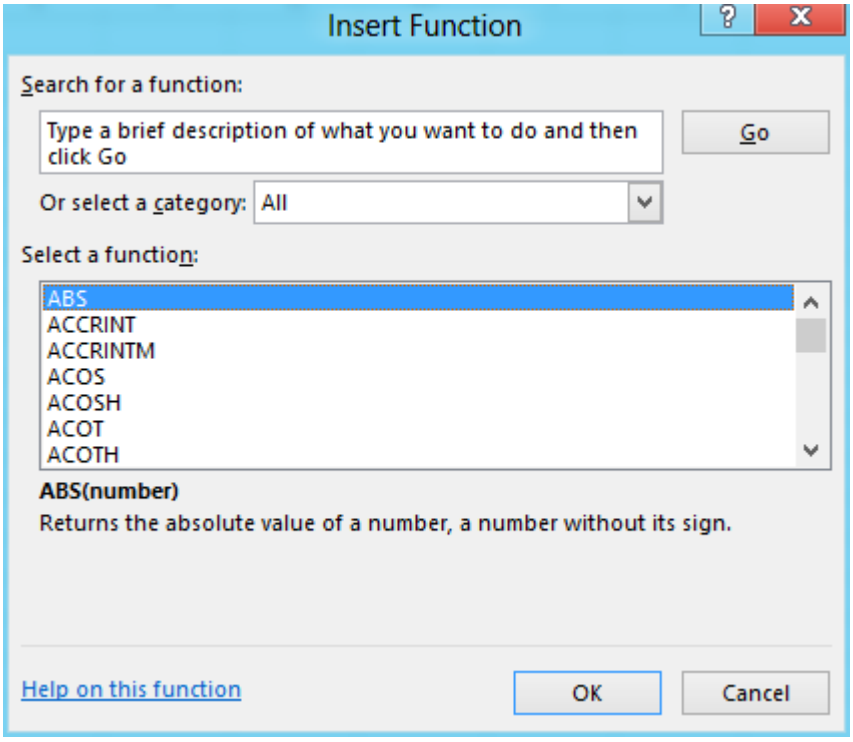


Figure 2-7: The Insert Function dialog box.

The **Function Arguments** dialog box guides you through entering the arguments for a selected function. This dialog box includes a brief description of each argument in the function.

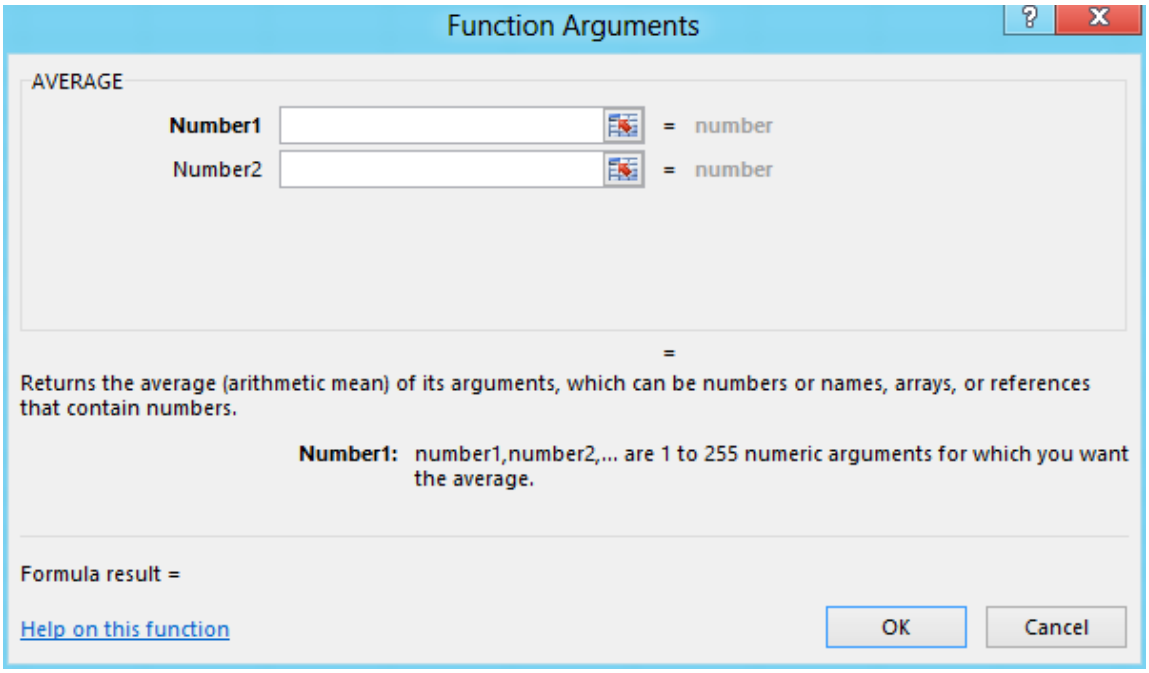

Function Arguments
AVERAGE
Number1
= number
Number2
= number
=
Returns the average (arithmetic mean) of its arguments, which can be numbers or names, arrays, or references that contain numbers.
Number1: number1,number2,... are 1 to 255 numeric arguments for which you want the average.
Formula result =
Help on this function
OK
Cancel

Figure 2-8: The Function Arguments dialog box for the AVERAGE function.

Improvements to Excel Functions

Excel 2013 has provided some new functions as well as improvements to existing functions. For some functions, additional improvements include:

- Improved algorithms that provide more accurate results.
- New names that align better with how they operate.
- Enabling the use of earlier versions of function names so users can use previous versions of select function names to ensure backwards compatibility with previous versions of Excel.

Automatic Workbook Calculations

By default, Excel 2013 automatically recalculates the value returned by a formula or function if the data the formula or function is calling changes. For example, if cell A4 contains a SUM function that sums the values in range A1:A3, and you change one of the values in range A1:A3, the SUM function in A4 will update automatically.

Sometimes, however, you might be in a situation in which you don't want the workbook to calculate automatically. In cases like this, you will want to disable automatic calculation.

How to Use Specialized Functions

As your data crunching needs grow and change, you will undoubtedly find yourself looking for ways to streamline your worksheets. You can use these methods to incorporate specialized functions into your worksheets.

Manually Insert a Function by Using the Formula Bar

To manually insert a function by using the **Formula bar**:

1. Select the cell that will contain the function.
2. In the **Formula bar**, type the function and its arguments.
3. Press **Enter**.

Insert a Function by Using the Function Dialog Boxes

To insert a function by using the function dialog boxes:

1. Select the cell that will contain the function.
2. Select **FORMULAS→Function Library→Insert Function**.
3. Locate the function you want to insert, and then select its name in the **Select a Function** list.
4. Select **OK**.
5. In the **Function Arguments** dialog box, identify each of the required arguments either by typing them directly into the text fields; or by using the **Collapse Dialog** button to temporarily shrink the dialog box so you can graphically select the cell or the range for each argument, and then selecting **Enter**.
6. If necessary, identify any optional arguments.
7. Select **OK**.

Disable Automatic Calculation

To disable automatic calculation:

1. In the workbook, select **FILE→Options**.
2. In the **Excel Options** dialog box, in the left pane, select **Formulas**.
3. Under **Calculation options**, selected your preferred method of calculation.
4. Select **OK**.

ACTIVITY 2-6
Using Functions

Before You Being

My_Author_Data.xlsx is open.

Scenario

You've found the functions you would like to use—AVERAGE and MIN—by using Excel's function reference. To review, your manager wants to know:

- The average number of books in print for the entire group of authors
- How long the newest author has been with the F&A family

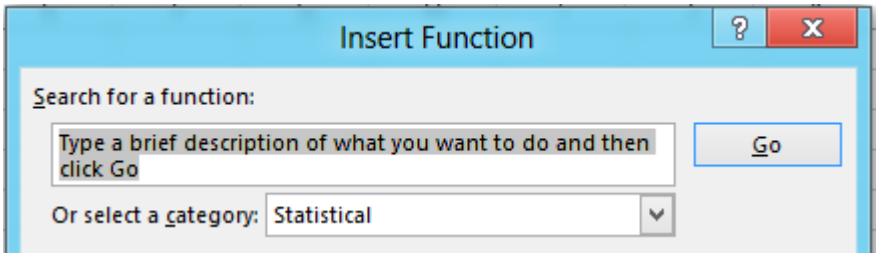
To help maintain readability in the Excel file, you decide to create a new spreadsheet named Statistics. You'll place the answers to each of these questions on that spreadsheet.

---

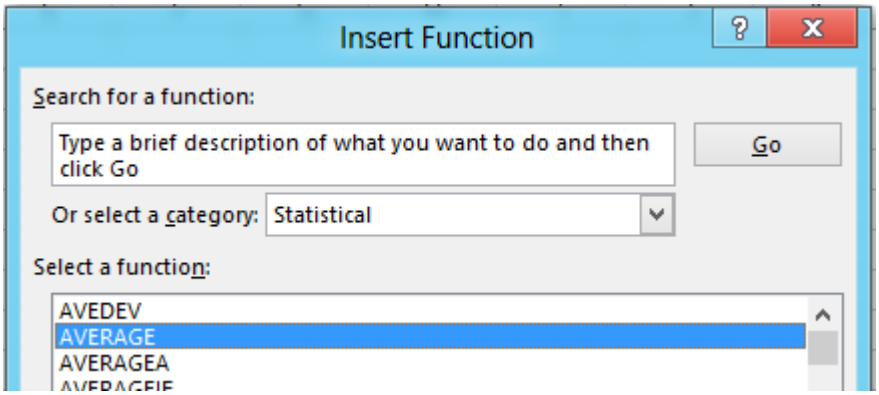
1. In **My_Author_Data .xlsx**, add a new worksheet named **Statistics** and make it the first worksheet in the workbook.

2. For each question your manager wants answered, add relevant text to the Statistics worksheet.
   a) Set the width of columns **A** and **B** to ***25***
   b) Select cell **A1**, and then type ***Average books in print***
   c) Select cell **A2**, and then type ***Newest to F&A***

3. Use the **Insert Function** and **Function Arguments** dialog boxes to enter a function that calculates the average number of books in print for the entire group of authors.
   a) Select cell **B1**.
   b) Select **FORMULAS→Function Library→Insert Function**.
   c) From the **Or select a category** drop-down list, select **Statistical**.


Insert Function
Search for a function:
Type a brief description of what you want to do and then click Go
Go
Or select a category:
Statistical

   d) In the **Select a function** list, select **AVERAGE**.



e) Select **OK**.
f) In the **Function Arguments** dialog box, in the **Number1** text field, type ***Number_of_Books_in_Print***
g) Select **OK**.

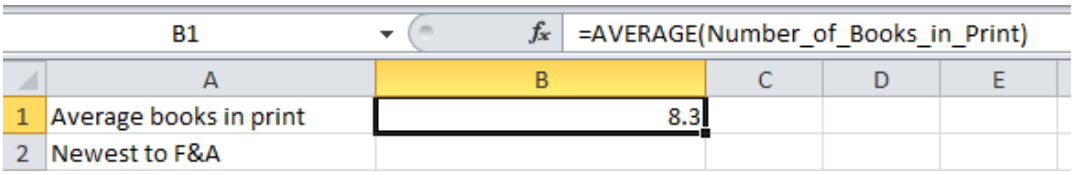
4. Why is Excel returning the #NAME error?

5. Fix the #NAME error.

a) Open the **Name Manager** dialog box.
b) Delete the current version of the **Number_of_Books_in_Print** range name.
c) If necessary, in the **Microsoft Excel** dialog box, select **OK**.
d) Create a new **Number_of_Books_in_Print** range name and set the scope of this new range name to **Workbook**.
e) In the **Refers to** text box, type ***=Authors_Totals!$D$2:$D$94*** and select **OK**.
f) If necessary, in the **Name Manager** dialog box, select **Close**.

6. Format the **Average books in print** cell so that it shows only one decimal place.

a) On the **Statistics** worksheet, select cell **B1**.
b) On the **HOME** tab, in the **Number** group, click **Decrease Decimal** until the value shows only one decimal place.



7. Enter a function that answers the question, "How long has the newest author been with the F&A family?"

a) On the **Statistics** worksheet, select cell **B2**.
b) In the **Formula bar**, type ***=MIN(Years_Under_Contract)*** and press **Enter**.
c) Format the cell so that it shows only two decimal places. The author who has been with F&A the least amount of time has been there 0.40 years (after rounding to two decimal places).

8. Save and close your work.

Summary

In this lesson, you created advanced formulas. You leveraged range names to make your functions and formulas easy to understand and maintain. You used specialized functions to run calculations on your data.

Creating advanced formulas is the gateway to some of the most sophisticated functionality Excel 2013 has to offer. By embedding multiple functions within a single, complex formula, you can transform raw business data into useful strategic information.

Consider your company and the types of data it creates and crunches. How might you leverage advanced formulas in your organization?

What are some range names you could use that are relevant to your company's data?

Note: Check your LogicalCHOICE Course screen for opportunities to interact with your classmates, peers, and the larger LogicalCHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen, you can also access available resources for a more continuous learning experience.

3 Analyzing Data with Logical and Lookup Functions

Lesson Time: 45 minutes

Lesson Objectives

In this lesson, you will:

- Leverage questions and testing to write formulas.
- Use logical and lookup functions to find answers to questions.

Lesson Introduction

The previous lesson introduced you to functions, how to find them in the Microsoft Office Excel 2013 function reference, and the various ways you can enter functions into your workbooks. Although there are many different types of functions, all functions generally fall into one of two broad categories: functions that crunch the numbers in a dataset and functions that find specific data within the dataset. Examples of functions that crunch the numbers include many of the financial, statistical, and engineering functions. Examples of functions that find specific data include the logical and lookup functions.

In this lesson, you will explore two of the function types that look for specific data in a dataset: logical functions and lookup functions.

TOPIC A

Leverage Questions and Testing to Write Formulas

Excel 2013 provides the tools you need to answer questions about your business's performance. However, it's up to you to ask the right question.

Start with Questions

Like most functions in Excel, logical and lookup functions help you find answers to your questions.

When you work with logical and lookup functions, it's a good idea to begin by thinking of the questions you want your data to answer.

For example:

- Which sales representative had the highest sales last quarter?
- Which products are for sale in Canada and were produced either in China or Indonesia?
- What is the employee ID for the employee who has been with the company the longest?
- Which department does Employee X work in?

By refining your questions prior to writing out your formulas, you'll be better prepared to write formulas that use logical and lookup functions in the most efficient way possible. Your questions will lead you to the types of logical and lookup functions you'll need to incorporate in your formulas.

For example, the question "Which sales representative had the highest sales last quarter?" suggests that you'll need to find a maximum value for a specific individual. This points to VLOOKUP and MAX being used together in some way.

The question "Which products are for sale in Canada and were produced either in China or Indonesia?" looks like it will, at a minimum, require AND and OR functions working together in some way.

Once you know the questions, and have an initial idea of which functions you'll need to use, then you can begin building your formulas.

End with Testing

After you've written a formula that uses logical and lookup functions, it's always good practice to thoroughly test your formula before you deploy it for use by others. You want to ensure that the formula performs exactly as expected.

TOPIC B

Use Logical and Lookup Functions to Find Answers to Questions

Logical and lookup functions can help you find the answers to many of the types of questions you will ask of your data.

Logical Functions

Excel 2013's logical functions run logical tests on your data. There are seven logical functions.

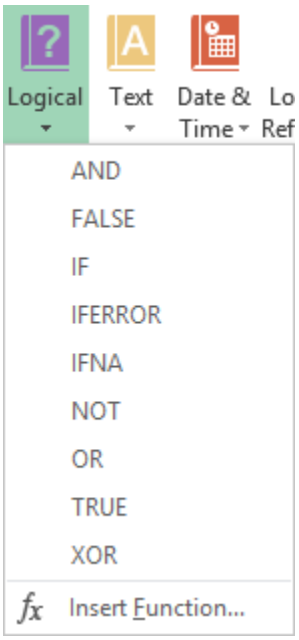


Figure 3-1: Logical functions.

Logical Function	*Description*
AND	**Syntax**: AND(logical_test1, [logical_test2], . . .) **Number of required arguments**: 1 **Number of optional arguments**: 0 to 254 (up to a maximum of 255 arguments) **Comments**: Returns TRUE only if all logical tests are true. Returns FALSE if one or more logical tests are not true. **Example**: AND(B2>C2, D2>=10) If the value in cell **B2** is greater than the value in cell **C2** and the value in cell **D2** is greater than or equal to 10, then this function will return TRUE. If either of those values is not true, the function will return FALSE.
OR	**Syntax**: OR(logical_test1, [logical_test2], . . .) **Number of required arguments**: 1

Logical Function	Description
	Number of optional arguments: 0 to 254 (up to a maximum of 255 arguments) **Comments**: Returns TRUE if one or more logical tests are true. Returns FALSE if all logical tests are not true. **Example**: OR(B2>C2, D2>=10) If the value in cell **B2** is greater than the value in cell **C2** or the value in cell **D2** is greater than or equal to 10, then this function will return TRUE. If both of those values are not true, the function will return FALSE.
FALSE	**Syntax**: FALSE() **Number of required arguments**: 0 **Number of optional arguments**: 0 **Comments**: This function has no arguments. You can enter it in a cell and the cell's value will appear as the text "FALSE."
TRUE	**Syntax**: TRUE() **Number of required arguments**: 0 **Number of optional arguments**: 0 **Comments**: This function has no arguments. You can enter it in a cell and the cell's value will appear as the text "TRUE."
IF	**Syntax**: IF(logical_test, [value_if_true], [value_if_false]) **Number of required arguments**: 1 **Number of optional arguments**: 2 **Comments**: This function runs the logical test in the first argument. If the logical test is true, the function returns the second argument. If the logical test is not true, the function returns the third argument. **Example**: IF(Income>Expenses, "Profit", "Loss") If the value in the **Income** cell is greater than the value in the **Expenses** cell, the function will return the text "Profit." If the value in the **Income** cell is not greater than the value in the **Expenses** cell, the function will return the text "Loss."
IFERROR	**Syntax**: IFERROR(value, value_if_error) **Number of required arguments**: 2 **Number of optional arguments**: 0 **Comments**: Use this function to catch errors in calculations. If the first argument evaluates to an error, the second argument will be returned. If the first argument does not return an error, then it (the first argument) is returned. **Example**: IFERROR(current_assets/current_liabilities, "Liabilities Equal Zero") If the value in the **current_liabilities** cell is zero (0), then no matter what the value is in the **current_assets** cell, you will get a divide-by-zero error. If that's the case, then the function will return the text "Liabilities Equal Zero." If **current_liabilities** is any number other than zero, then Excel will run the calculation and divide **current_assets** by **current_liabilities.**
NOT	**Syntax**: NOT(logical_test)

Logical Function	Description
	Number of required arguments: 1 **Number of optional arguments**: 0 **Comments**: This function returns the opposite of either TRUE or FALSE depending on how the logical test evaluates. If the logical test evaluates to TRUE, the function will return FALSE. If the logical test evaluates to FALSE, the function will return TRUE.

How to Write Formulas That Use Logical Functions

Use these steps to begin incorporating logical functions into your worksheets.

Note: Access the **Checklist** tile in the LogicalCHOICE Course screen to view all How To procedures for this lesson.

Write a Formula that uses Logical Functions

To write a formula that uses logical functions:

1. Write, revise, and refine the question you want to ask your data.
2. Using your question as a starting point, use the Function Reference in the Excel Help system to identify which logical functions you will need to use to answer your question.
3. Identify how many required and optional arguments each function has and whether you will need any of the optional arguments.
4. Identify whether the arguments in one function will be other functions.
5. In the **Formula bar**, type the formula with its functions and arguments.
6. Press **Enter**.
7. Test the formula.

ACTIVITY 3-1
Working with Logical Functions

Data File
C:\091015Data\Analyzing Data with Logical and Lookup Functions\Author_Data_02.xlsx

Scenario
Your manager likes what you've done so far and has a couple more things she'd like you to add to the workbook, namely:

- F&A management likes to keep an eye on new authors who are also early producers. They define early producers as any author who has been under contract for fewer than two years and has published more than four books. Your manager would like to know which authors fit these criteria.
- Occasionally, F&A likes to reward authors who are either high producers or have been with the company for more than five years. High producers are any authors who have published 10 or more books with the company. Your manager wants to be able to know at a glance whether an author meets one of these criteria.

You decide to create new columns on the **Author_Totals** worksheet and use logical functions to answer these questions.

---

1. Open the file **Author_Data_02.xlsx**.

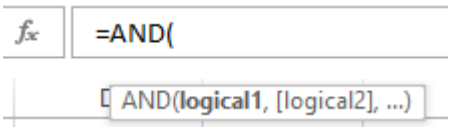
2. On the **Author_Totals** worksheet, add column labels for **Early Producers** and **5+ Years or High Producer**.
   a) Select cell **H1**, and then type ***Early Producer?***
   b) Select cell **I1**, and then type ***5+ Years or High Producer?***
   c) Format these cells so they match the format of the other labels.

	A	B	C	D	E	F	G	H	I
1	AuthorID	Initial Contract Date	Years Under Contract	Number of Books in Print	Number of Books Sold	Sell Price	Income Earned	Early Producer?	5+ Years or High Producer?

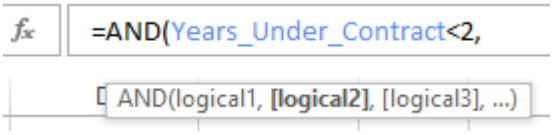
3. By using range names, write a formula that defines early producers as any author who has been under contract for fewer than two years and has published more than four books.
   a) Select cell **H2**.

> **Note:** You can go to **FORMULAS→Defined Names Group→Name Manager** to find the range names.

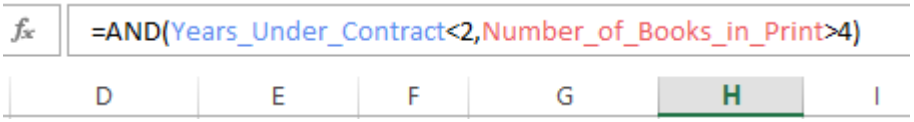
   b) In the **Formula bar**, type ***=AND(***
   c) Observe that Excel provides visual guidance on where you are in the syntax of the function. The argument that appears in bold indicates the argument in which the insertion point is currently placed.



d) Type ***Years,*** and double-click **Years_Under_Contract** when it appears in the list.
e) Type ***<2,***



f) Type ***Number,*** and then double-click **Number_of_Books_in_Print** when it appears in the list.
g) Type ***>4)***



h) Press **Enter**.
i) To copy the formula to every cell in the range, select cell **H2** and then double-click the selection handle in the bottom right corner of the cell.

4. Verify that the formula works as expected.

5. Observe the range **C2:H2**.

Is the formula working correctly for this author?

6. Observe the range **C5:H5**.

Is the formula working correctly for this author?

7. Save your work as ***My_Author_Data_02.xlsx*** in the **Analyzing Data with Logical and Lookup Functions** folder.

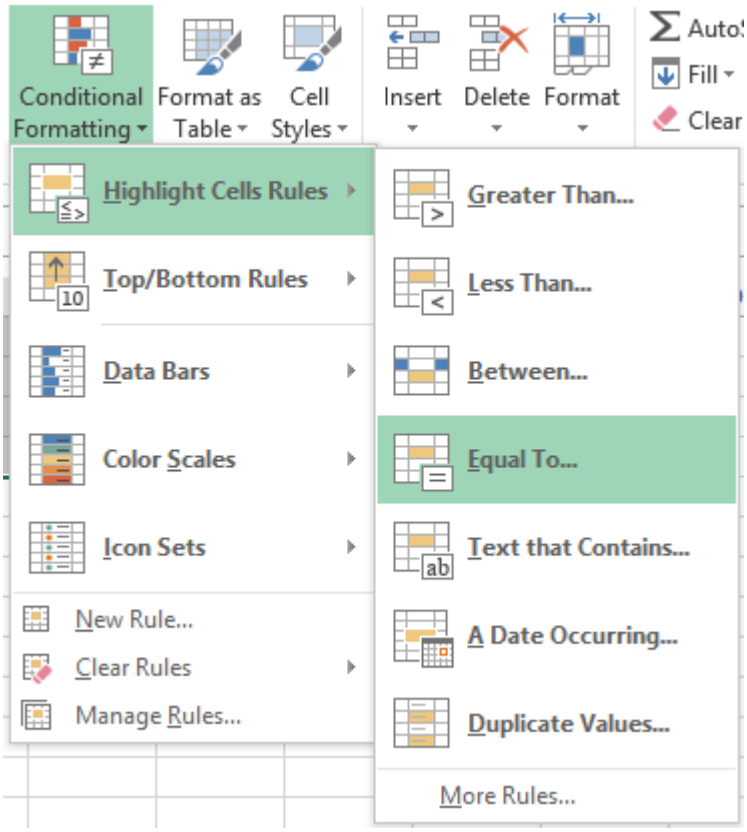
8. How would you write a formula that identifies any authors who have either been with the company for more than 5 years or have published 10 or more books with the company?

9. Write and test the formula you planned in the previous step.

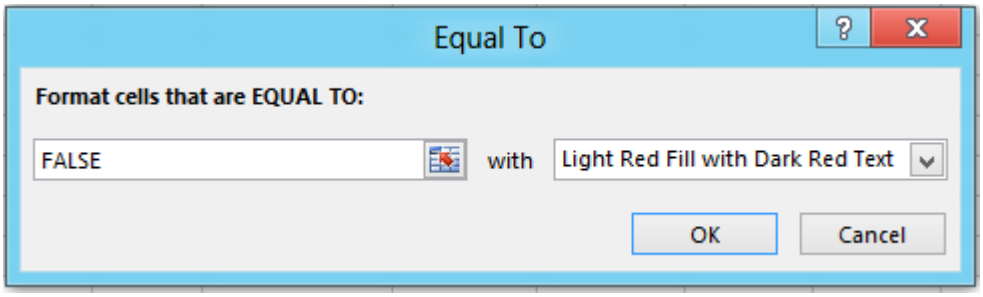
10. After entering the formula, what are the values in cells I2 and I4?

11. Save your work.

12. Apply conditional formatting to make it easier to visually identify which cells in the range **H2:I94** are TRUE and which are FALSE.
a) Select the range **H2:I94**.
b) Select **HOME→Styles→Conditional Formatting→Highlight Cells Rules→Equal To**.



c) In the **Equal To** dialog box, in the **Format cells that are EQUAL TO** text field, type ***FALSE***
d) Verify that **Light Red Fill with Dark Red Text** is selected in the **with** drop-down list.



e) Select **OK**.
f) Follow the same steps, but this time format cells containing **TRUE** with **Green Fill with Dark Green Text**.

13. Save your work.

ACTIVITY 3-2
Combining IF and AND Functions

Before You Begin
My_Author_Data_02.xlsx is open.

Scenario
The conditional formatting in columns **H** and **I** improve readability; however, you feel that the words TRUE and FALSE don't really answer the questions suggested by the column labels. You'd rather see these cells display either "Yes" or "No" so there's no confusion for anyone else who might be using this worksheet. You decide that you will use an IF function that tests whether the value in the cell is TRUE or FALSE. If the value is TRUE, the cell will display "Yes," and if the value is FALSE, the cell will display "No."

---

1. In **My_Author_Data_02.xlsx**, on the **Author_Totals** worksheet, change the conditionally formatted cells in column H so that any TRUE state remains green but reads Yes (instead of TRUE) and any FALSE statement remains red but reads No (instead of FALSE).
   a) Select cell **H2**.
   b) Clear the contents of the **Formula bar**.
   c) In the **Formula bar,** type
   =IF(AND(Years_Under_Contract<2,Number_of_Books_in_Print>4)=TRUE,"Yes","No")
   d) Press **Enter**.
   e) Copy the formula to the remaining cells in the range.
   f) Verify that the formula works correctly.

2. Save your work.

3. **How would you change the formula in column I so it has the same treatment as column H?**

4. Use your aforementioned plan to change the formula in column **I**.

5. If necessary, conditionally format the data in columns **H** and **I** so that Yes appears in a green style and No appears in a red style; then center align the data in those columns.

G	H	I
Income Earned	Early Producer?	5+ Years or High Producer?
$1,261,785.63	No	Yes
$2,066,214.56	No	Yes
$2,042,643.50	No	No
$916,555.01	Yes	Yes
$50,507.08	No	Yes
$3,116,632.12	No	Yes
$263,086.79	No	No

6. Save your work.

VLOOKUP and HLOOKUP Functions

VLOOKUP and HLOOKUP are powerful functions that enable to you find data based on specific criteria. These are the types of functions that help you find answers to questions such as, "What year did Employee *X* start working here?"

VLOOKUP and HLOOKUP functions can be used within a single worksheet, across multiple sheets in a single workbook, or across multiple workbooks.

The data returned from a VLOOKUP or HLOOKUP function can either be displayed in a cell or used as an argument in a function. The identified data can be displayed in a cell or used in a calculation.

The VLOOKUP Function

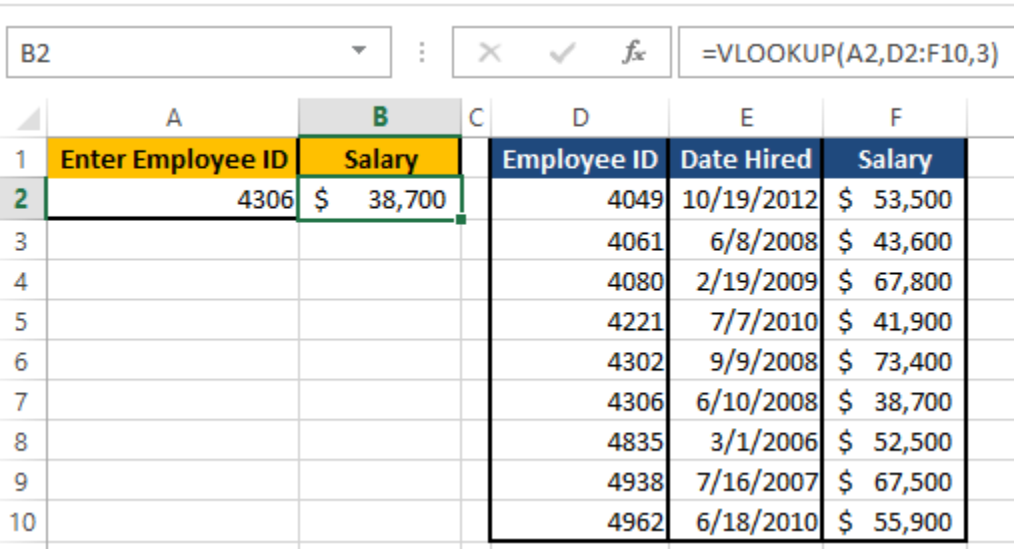
Syntax: VLOOKUP(lookup_value, table_array, col_index_num, [range_lookup])

Number of required arguments: 3

Number of optional arguments: 1

The lookup_value is the value you already know, for example, the employee's ID number. The table_array is the range of cells that contain all of the data you need to search—including the data you already know, such as the employee's ID in the first column. It's important to remember that the first column of the table_array must contain the value you already know. The col_index_num is the number of the column in the table_array that will contain the answer, or the information you don't know. VLOOKUP first looks top to bottom in the first column of the array. Once it finds the lookup_value, it then looks left to right—not right to left—until it gets to the column identified in the col_index_num argument.

Note: To further explore the power of lookup functions, you can access the LearnTO **Combine Excel's MATCH and INDEX Functions to Look Up Data** presentation from the **LearnTO** tile on the LogicalCHOICE Course screen.



	A	B	C	D	E	F
1	Enter Employee ID	Salary		Employee ID	Date Hired	Salary
2	4306	$ 38,700		4049	10/19/2012	$ 53,500
3				4061	6/8/2008	$ 43,600
4				4080	2/19/2009	$ 67,800
5				4221	7/7/2010	$ 41,900
6				4302	9/9/2008	$ 73,400
7				4306	6/10/2008	$ 38,700
8				4835	3/1/2006	$ 52,500
9				4938	7/16/2007	$ 67,500
10				4962	6/18/2010	$ 55,900

Figure 3-2: Example using the VLOOKUP function.

Cell **B2** contains the VLOOKUP function. This function answers the question, "What is Employee X's salary?" First, the function looks for the value in cell **A2** in the first column of the range **D2:F10**. It starts at the top and goes toward the bottom of the column until it finds a value that matches the value in **A2**. As soon as it finds that value—4306 in this example—it starts looking from left to right across the same row in which it found the value **A2**—in this example, that would be row **7**. It counts across the columns until it gets to the column index indicated in the third argument—3, in this example—and then returns the value in that cell—$38,700.

The HLOOKUP Function

Syntax: HLOOKUP(lookup_value, table_array, row_index_num, [range_lookup])

Number of required arguments: 3

Number of optional arguments: 1

The HLOOKUP functions similarly to the VLOOKUP, except instead of looking vertically for the lookup_value, HLOOKUP looks horizontally across row headings.

	A	B	C	D	E
1	Enter Author ID			1006	1021
2	1021		Initial Contract Date	5/5/2010	8/6/2004
3			# of books in print	15	14
4	Books Sold		# of books sold	316,237	344,944
5	344,944		Income earned	$ 1,261,785.63	$ 2,066,214.56

Figure 3-3: Example using the HLOOKUP function.

Cell **A5** contains the HLOOKUP function. This function answers the question, "How many books has author 1021 sold?" First the function looks for the value in cell **A2** in the first row of the range **C1:E5**. It starts at the left and moves to the right until it finds a value that matches the value in **A2.** As soon as it finds that value—1021 in this example—it starts looking from the top to the bottom of the same column that it found the value in **A2**—in this example, that would be column **E**. It

counts down the rows until it gets to the row index indicated in the third argument—4, in this example—and then returns the value in that cell—344,944.

The TRANSPOSE Function

The **TRANSPOSE** function returns a vertical range of cells as a horizontal range, or vice versa. The **TRANSPOSE** function must be entered as an array formula in a range that has the same number of rows and columns, respectively, as the source range has columns and rows. Use **TRANSPOSE** to shift the vertical and horizontal orientation of an array or range on a worksheet.

ACTIVITY 3-3
Working with Lookup Functions

Before You Begin
My_Author_Data_02.xlsx is open.

Scenario
Your manager has indicated that she'd like to be able to type in an author's ID number and instantly know how many books the author has sold—without having to scroll around the worksheet.

You have decided to add a VLOOKUP function to the statistics worksheet to address this need.

---

1. In **My_Author_Data_02.xlsx**, on the **Statistics** worksheet, add a VLOOKUP function that enables a user to enter an author's ID and have the total number of books sold for that author returned.
   a) Select cell **A8**.
   b) Type ***Enter Author ID***
   c) Select cell **B8**.
   d) Type ***Total Number of Books Sold***
   e) Format both of these cells so they have a dark blue background with bold white text.
   f) Select cell **B9**.
   g) Type ***=VLOOKUP(A9,Author_Totals!A2:E94,5,FALSE)***
   h) Press **Enter**.
   i) To verify that the function works, in cell **A9**, type ***1006*** and then press **Enter**.

	A	B
1	Average books in print	8.3
2	Newest to F&A	0.40
3		
4		
5		
6		
7		
8	*Enter Author ID*	*Total Number of Books Sold*
9	1006	316237

   j) Select the **Author_Totals** worksheet and verify that the total number of books sold for ID 1006 is 316,237.

2. Save and close your work.

Summary

In this lesson, you analyzed data with logical and lookup functions. You worked with logical functions such as AND and OR and lookup functions such as VLOOKUP and HLOOKUP to find the answers to specific questions you had—answers that could be found only within your dataset.

What types of questions could you ask of your company's data that VLOOKUP or HLOOKUP could help you find the answers to?

What are some examples of how logical functions such as AND and OR can help you analyze your company's data?

Note: Check your LogicalCHOICE Course screen for opportunities to interact with your classmates, peers, and the larger LogicalCHOICE online community about the topics covered in this course or other topics you are interested in. From the Course screen, you can also access available resources for a more continuous learning experience.

Lesson Labs

Lesson labs are provided as an additional learning resource for this course. The labs may or may not be performed as part of the classroom activities. Your instructor will consider setup issues, classroom timing issues, and instructional needs to determine which labs are appropriate for you to perform, and at what point during the class. If you do not perform the labs in class, your instructor can tell you if you can perform them independently as self-study, and if there are any special setup requirements.

Lesson Lab 3-1
Updating the Author Totals Worksheet

Activity Time: 15 minutes

Data Files

C:\091015Data\Analyzing Data with Logical and Lookup Functions \Updating_Author_Totals.xlsx

Scenario

In addition to identifying early producers and high producers, management would also like to identify authors who have been with the company for more than five years and have either sold over 350,000 units or earned more than $1 million.

You also plan to add a column identifying which royalty rate an author currently receives.

F&A royalties are based on the number of books an author has published with the company. Authors with 10 or more books receive a 15% royalty and all others receive a 9% royalty. You decide to add a column that reflects which royalty rate each author is receiving.

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1. In **Updating_Author_Totals.xlsx**, on the **Author_Totals** worksheet, select cell **J1** and type ***5+ Years*** and ***350K+ Units Sold***
2. Select cell **K1** and type ***Royalty Rate***
3. In cell **J2**, write a formula that identifies authors who have been with the company for more than five years and have either sold over 350,000 units or earned more than $1 million.
4. Copy the formula to every cell in the range **J2:J94**.
5. Format the range **J2:J94** to match the conditional formatting of cells **H2:I94**.
6. In cell **K2**, write a function that shows authors with 10 or more books published receiving a 15% royalty rate and all others receiving a 9% royalty rate
7. Copy the formula to every cell in the range **K2:K94**.
8. Save your work as ***My_Updated_Author_Totals.xlsx***